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DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JUNE, 1833.

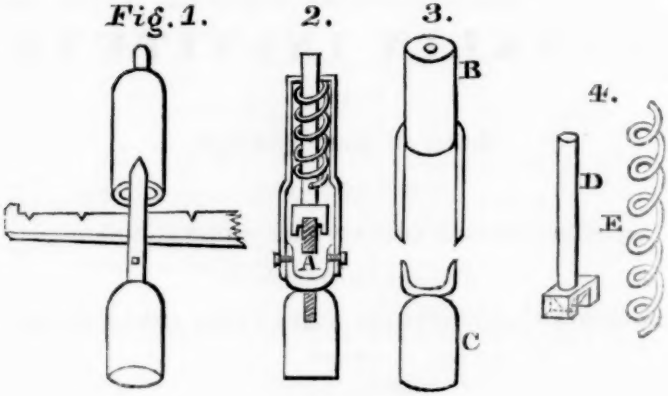
On the Spring Safety Valves of the Boilers of Locomotive Engines.

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—

Observing that the improved *spring balances* are being brought into general use, for loading the safety valves of the boilers of locomotive engines, I will take the liberty of pointing out some of their defects, when applied to that purpose. In the first place, the apparatus permits the valve to be loaded to an unlimited degree, by screwing the nut until the index is drawn out to its full extent, the common method of attaching them to the lever being by means of a screw and adjusting nut. The facility with which the valve can be overloaded will prove, in the hands of careless or ignorant persons, a source of great danger. Secondly, when the steam is high enough to blow off, the load increases with the pressure of the steam; this was proved by an experiment with a safety valve, the lever of which was so proportioned that one pound at its end, gave ten pounds pressure on the valve. When the valve was closed, the index of the balance stood at 12 lbs., (the index moves through a space of about one-eighth of an inch for each pound,) and when the steam began to blow off, the index pointed to fourteen pounds; showing that there was an additional pressure of nearly 20 lbs. on the valve. It is well known that the use of the simple weight was laid aside on account of the tenden-

cy to batter the valve, and to permit the escape of steam, from the tremor of the carriage. I purpose now to suggest a plan which I think will not have the disadvantages just spoken of as belonging to the common weight, nor those before alluded to as affecting the spring weighing machine. It is illustrated by the following figures.



In fig. 1 is shown part of the usual lever, with an *improved weight;* the apparatus is shown more completely by fig. 2, which is a cross section of fig. 1, in which A is the lever upon which rests a weight suspended by a spring. Fig. 3 shows a cylinder, B, or case, to contain a spring and stem, the latter having a hole in its top through which the stem works. C is the weight which is secured to the fork on the lower end of the case.

In fig. 4 the stem and saddle is shown in detail, and E is a spiral spring of steel; this is made to work freely between the inside of the case and stem, the upper end being fastened to the top of the case, and the lower to the pin on the stem.

Yours, respectfully,
A. C. J.

Note on the Properties of Silicon.

By Robert Hare, M. D. Professor of Chemistry in the University of Pennsylvania.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Since I enclosed to you my paper on the evolution of silicon, I have made the following observations. The silicon left

after repeated washings in cold water, and subsequent digestion in successive portions of boiling water, is, while moist, of a chocolate brown colour, but, by desiccation, this changes to a brownish ash, or to an ash with a very slight tinge of red.

Thus obtained, silicon does not appear to be acted upon either by sulphuric, nitric, muriatic, or fluoric, acid, nor by nitrate of potash when liquified by heat.

It seems to be soluble for the most part in a mixture of nitric and fluoric acids, which, by analogy, we may call nitro-fluoric acid; but after exposure for eighteen hours to this solvent, a small proportion of a black matter remained undissolved. This is, in all probability, carbon derived from the potassium, which, according to Berzelius, when obtained by Brunner's process, contains some combined carbon.

The solution in nitro-fluoric acid decanted from the residual black powder into a solution of pearlash, gave a copious white, gelatinous, precipitate like silex, which when thrown into a large quantity of water, subsided undissolved. When on subjecting the silicon to red hot nitrate of potash, an hydrous carbonate of the same alkali was added, so as to co-operate with the nitre, an explosive effervescence took place; all the silicon disappeared, and a compound resembling the silicate of potash was produced. This anomalous reaction may be considered as characteristic of silicon.

The impression that the black matter insoluble in the nitro-fluoric acid, was carbon, is confirmed by the fact, that after the silicon had been digested for some hours in strong nitric acid, and finally boiled in it to dryness, it dissolved in nitro-fluoric acid without any such residuum. As in the first instance, the resulting liquid when poured into a solution of subcarbonate of potash, gave a gelatinous precipitate.

You will perceive that these observations coincide, nearly, with those of the great chemist, to whom we owe the discovery of silicon.

FRANKLIN INSTITUTE.

Third Monthly Meeting for Conversation on Mechanical Subjects.

Mr. David Mason exhibited a diagram of a gauge contrived by him for determining the diameters of wheels, of any required number of teeth. By this instrument the mechanic is enabled to determine without the necessity of calculation, the diameter of a wheel of which the number of teeth is given. It is more general in its application than the scale now sometimes used for a similar purpose. The instrument will be, it is understood, submitted to the Committee on Inventions.

Mr. Franklin Peale exhibited and explained certain mechanical paradoxes. Questions growing out of the subject gave rise to a discussion in which many of the members took part.

There was placed upon one of the tables for the examination of the members a plough and grooving plane, by Mr. I. White, which attracted much attention from the neatness of the workmanship.

Mr. Fox explained, by reference to a model of the full size, a substitute for the common forcing pump, which he had recently patented; this supply apparatus is intended to keep the water of a boiler at a constant level, and to be self-acting. The difficulties encountered in practice in the use of the rotary supply cock, patented some months since, (see this Journal, vol. x. p. 160,) were stated without any reserve by Mr. Fox. He also spoke of an unsuccessful attempt to substitute a slide supply valve for the cock just alluded to. The evening was closed by the examination of the merits of the device of Mr. Fox, and a general discussion in relation to self-regulating apparatus, as means of safety to steam-boilers.

Bibliographical Notices.

Cabinet Cyclopedia. Mechanics by Capt. Henry Kater, V. Pres. R. S., &c. and the Rev. Dionesius Lardner, L. L. D., F. R. S., &c.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Having observed that your call for a review of the Mechanics of the Cabinet Cyclopedia has not been responded to, a student of mechanics would respectfully offer, in the absence of a more able commentator, a few remarks upon that part of the treatise to which he has referred. This undertaking might seem presumptuous, were it not that as the work is avowedly for the purpose of bringing a knowledge of the subject treated, within the reach of all grades of persons, a student but little versed in the subject, may, by his own difficulties, judge more accurately, perhaps, of the success of the author, than one who had a greater preliminary stock of knowledge. He proposes to consider, separately, a few of the most prominent chapters in the order in which they are given in the work itself, and to direct his observations, principally, to the manner in which the work, as a *popular treatise*, is executed.

The treatise begins, as indeed all treatises on mechanics should begin, with a statement of the principle of *inertia*. In this chapter there is simple language, and familiar, though convincing reasoning; in other words, the essence of true popularity in scientific writing. The examples are excellent: those throughout the book indeed with few exceptions deserve the same praise. If a student ventures to object that the rejection of the laws of motion of Newton has not simplified the subject, and that the argument is at least in one case, loose, it is that he finds himself backed by the authority of no less a man than Professor Whewell, of Cambridge, England.

Resolution of Force.—The examples under the head of composition and resolution of force are excellent; but in one of them a mistake has been pointed out to us. It is in the case of the boat urged by oars and tide. It is here supposed, first, that with no current the force of the oars is able in any time, say one hour, to impel the boat from a point on one side of the stream to another directly opposite; and then the distance which the force of the current, acting alone, would carry the boat in the same time being assigned, the diagonal direction being that actually taken, will, of course, conduct the boat to a point lower down than that directly opposite on the other side.

If the object then, says Dr. Lardner, be, from the *same starting point*, to reach this last point, the rowers must imagine one at such a distance above it, that the current could float the boat along that distance in the *same time* that the force of the oars, acting alone, would require, to impel the boat from the starting to the imaginary point.—But it seems plain that this time cannot be the *same*. For the distance between these last two points being greater than that between the two opposite points, will require a greater time to be passed over with the same moving force; and before this time, then, has elapsed, the boat will have come opposite in the stream to its true point of destination; to attain which in the same time (one hour in this case) in the way directed to be pursued, would require that the opposite bank should come nearer. It is plain that to reach the true landing place in the *same time*, the rowers must carry their boat to another starting place higher up the stream, and easily determined.

Attraction of Gravitation.—More definite ideas than are always found on this subject, might be communicated, we think, by stating distinctly that the attractive force between any two (or more) bodies is one and the same in quantity; so that the tendency of either body towards the other is, in all cases, equal to that of the other towards it. It will be easily understood, then, that any increase or diminution of the mass of either, will not be attended with any alteration of its own velocity, since the corresponding alteration of force is shown in the first case by the motion of a larger, and in the second by the motion of a smaller mass with the same velocity; but the mass of the other body not being altered, any alteration of the moving force acting on it, can be shown only by a corresponding alteration in the velocity of its motion. It will be further understood, with ease, that they must then *meet* at a point as much nearer the larger body than the midway point, as the mass of the larger exceeds that of the smaller, since the velocity of either is invariably as its mass.

Terrestrial Gravity.—The chapter with this title is an example of a completely successful application of reasoning which all can understand, to the analysis of complicated phenomena: it shows how far a *truly* popular work can go into the heart of science. Some parts might have been more quickly comprehended, had the train of reasoning been drawn out a little further. But we say only *more quickly:* a second perusal is equivalent.

Centrifugal Force.—It is to be regretted that a more exact analysis of this most important subject has not been presented in the present work, particularly as greater facility of comprehension would have been the immediate consequence to the reader. The primary derivation of the idea is good. "There is, however, another cause which produces a pressure upon the curve, and which has no operation in the case of the inclined plane. By the property of inertia, when a body is put in motion in any direction, it must persevere in that direction unless it be deflected from it by an efficient force. In the motion down an inclined plane, the direction is never changed, and, therefore, by its inertia the falling body retains all the motion impressed upon it, continually, in the same direction; but when it descends upon a curve, its direction is constantly varying, and the resistance of the curve, being the deflecting cause, the curve must sustain a pressure equal to that force which would thus be capable of continually deflecting the body from the rectilinear direction in which it would move in virtue of its inertia. This pressure entirely depends upon the curvature of the path in which the body is constrained to move, and on its inertia, and is therefore altogether independent of the weight, and would, in fact, exist, if the weight were without effect."—p. 83.

Then succeeds the following sentence, before the introduction of which, what is evidently wanted is an application of the resolution of force.

"This pressure has been denominated *centrifugal force*, because it evinces a tendency of the *moving* body to *fly from the centre* of the curve in which it is moved."

The resolution of force is wanting here to determine not only the quantity of this pressure, but also its actual *direction*. If the theory of the resolution of force be studied, it will indeed be plain that this direction must be, at any point, perpendicular to the curve, the other element of the moving force acting in the direction of the curve; but those who for the first time view a subject, particularly if they be ordinary readers, are not apt to regard it in this elementary way.

The law of the variation of this pressure, or centrifugal force with the velocity of the moving body, and the curvature of its path, is simply stated, without any development of the reasons why it should be expected to hold. "To estimate the rate at which this pressure in general varies, it is necessary to multiply the square of the number expressing the angular velocity by that which expresses the radius of curvature, and the force increases in the same proportion as the product thus obtained."—p. 84. Yet this law seems to admit of a simple derivation by the aid of the reasoning employed in this and other chapters.

Taking first the radius of curvature to be the same, then the centrifugal force must increase with the variation of the path of the body in any given time, and with its momentum, (and may, therefore, be represented by the product of the numbers expressing these.) For by the application of the resolution of force it will easily appear, that

the greater, in any given time, the deflection of the body from its path by the resistance of the curve, the greater the pressure against the curve; and that with every increase of momentum of the body in the direction of its motion at each instant, (i. e. in the *tangential* direction,) its momentum in each element of that direction, and, therefore, in the centrifugal direction, will be proportionally increased. Now, the deflection is measured by the circular arc, or, in other words, the *space* gone over in a *given time*, and this again measures the *velocity* of the body's motion; and momentum is represented by the product of the mass of the body moving, multiplied by its *velocity*. The product, then, of the mass of the body, by the *square* of its velocity, may be substituted for the first expression, to represent the centrifugal force.

As we now refer to one and the same curve, the actual velocity of the body may be represented by, or rather is identical with, the angular velocity, which is therefore substituted for it as a more convenient and manageable term. But when the lengths of the radii of the circles of curvature vary, angular velocity is no longer a measure of actual velocity, since the actual length of arcs subtending the same angle increase in proportion to their distance from the angular points. To make angular velocity, in this case, a measure of actual velocity, the length of the radius must, then, be taken into account, and we must multiply the square of the angular velocity by the radius of curvature, in order to get the expression for the centrifugal force, as it depends upon velocity and curvature; and this product again by the mass, to obtain one for the total centrifugal force.

It has been the object of the writer, in these remarks, to show, in a general way, how this law of the variation of centrifugal force, with the velocity, &c., might be made out to the popular reader, with sufficient exactness for his purpose.

The representation of centrifugal force, as a pressure necessarily exerted by a body moving on the inner surface of a hollow sphere, against that surface, is perhaps the most popular form in which the idea can be presented, and if the forces in action be well presented and distinguished, seems to be equally accurate.

The author is not perhaps as happy in the choice of one or two of his examples on this subject, as he usually is. The stone whirled by the hand, in a sling, in a direction perpendicular to the ground, and which "will not fall out of the sling, even when it is *at the top of its circuit*," is a clear and impressive example; for at the top of the circuit, gravity, acting as it then does in the direction of the string and hand, may be considered as the force which retains the stone in its orbit, (although, of course, it is the muscular force of the hand, and the cohesion of the parts of the string, which really do this;) and it is then directly opposed to the centrifugal force. But the glass of water, "whirled so rapidly, that even when the mouth is presented downwards, the water will still be retained in it by the centrifugal force," does not appear to us to be so fortunate. There are too many forces, and too many directions, to be put without comment into the

hands of a reader, immediately after the first elementary exposition of the force under illustration.

Centre of Gravity.—The manner in which the idea of the centre of gravity is derived, by first obtaining a single force which is equivalent in value and direction to the sum of the forces acting on all the particles of a mass, and then showing that the direction of this force must always pass through *one point* in a body, whatever be the position of the latter, is unrivalled for clearness and simplicity. To take an example of the effect of this method of explaining the subject; every reader must at once perceive that this equivalent force must be met, in order to produce an equilibrium, by another (equal in value) acting in the same line of direction, but opposed to it. But how to determine the actual direction out of the many parallel ones that may be chosen? The *position of the centre of gravity* determines this, for the line of direction must pass through that one point. The advantage of giving a reader this natural synthetical way of getting at the subject must be obvious.

The examples in this chapter are excellent. The use of the flexibility of the knee joint in lessening the labour of walking, is one, but as a consideration of the motion of the centre of gravity is not *necessary* here, (for all must see that with a wooden leg, the whole weight of the body must be partially elevated,) not as good a one in its place, perhaps, as some others.

Mechanical Properties of an Axis.—This appears to a student to be the worst chapter in the book, (of those belonging to Dr. Lardner.) He speaks solely in reference to the *design* of the work as a popular treatise. The only part of it which appears intimately connected with the other parts of the subject is that which relates to the "moment round an axis," and to the "moment of inertia," and is unfortunately crowded in, among a mixture of facts and partial reasonings which few readers, he thinks, would be likely to understand or remember, as they are there presented.

The Pendulum.—The centre of oscillation is very well derived. Much of the true popularity of this kind of writing consists in giving a clear idea of the meaning of such expressions as this, and particularly of the utility there is in conceiving the existence of such imaginary *loci*. We noted above how clearly this is done with respect to the centre of gravity.

Watch and Clock Work.—There is some confusion on this subject, and a general view of the works of a common watch is given in the figure marked 111 (bis) without any fusee.

The manner in which time is divided into small equal parts by clocks and watches, is calculated to convey a good idea of the various kinds of motion. When weights are used, as in stationary clocks, the uniformly accelerating force of gravity is the moving power, and all that is wanted to make the weight and the hands, which it finally turns, describe equal spaces in equal portions of time, is a contrivance to stop the uniform acceleration at each instant, which is done by the pallets of the escapement wheels moved by the pendulum. But in portable chronometers, watches, and the small pendulum time pieces,

such as usually stand on mantle pieces—the moving power being the elastic force of a spring in the act of unwinding itself, and therefore not in a state of *uniform* tension, is a force which, though constantly applied, and therefore accelerative, is not uniform in power, and therefore not uniformly accelerative. The first step here in the process of procuring equal divisions of time, is therefore to reduce this unequally accelerating force to one uniformly accelerating; which is effected by the fusee. The second is the same which is done in the standing clock, viz. to stop the uniform acceleration at each instant. In watches and portable chronometers, the pallets of an escapement wheel, moved by the balance wheel, (which is kept in a state of vibration by the hair spring,) performs this work, and in the small mantel time-pieces a pendulum.

The Pulley.—There are three divisions of the mechanic powers given in this work, viz. the lever, the cord, and the inclined plane. The second of these, the cord, includes all those cases in which force is transmitted by means of flexible threads, ropes, or chains, and therefore embraces the pulley. As the principle by which the mechanical efficacy of these machines is determined was new to the student,* he will attempt a very short analysis of its application in a few of the principal cases.

This principle is simply the following: that "from the definition of a flexible cord, *its tension, or the force by which it is stretched, throughout its entire length, must be uniform;* or, in other words, that the *force by which it is stretched, must, throughout its entire length, be the same.*"

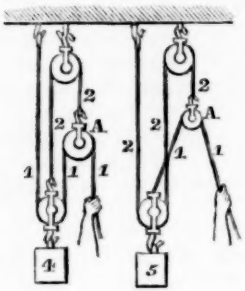
In the fixed pulley, the weight must, by this principle of tension, produce the same tension in every part of the cord, and therefore the same in that part to which the power is applied, as in any other. But the part of the cord to which the weight is attached is stretched by the whole weight of the latter, and, therefore, the weight must produce a tension at that part of the cord at which the power acts equal in force to its own weight, which tension must be met, in order to produce an equilibrium, by an equal opposing force in the power. Hence the power and the weight are, in this machine, equal. The block and sheave, it must be observed, evidently support the united tensions of power and weight.

In the single moveable pulley, the tension produced by the weight must, by the principle of tension, produce an equal tension at the fixed end of the cord, and at that to which the power is applied; and the fixed support and the power must, therefore, be equally engaged in supporting the weight; a weight will therefore be supported equal in force to twice the power. 1 to 2 will then be the ratio of power to weight in this pulley.

We have space only to show the application of the same principle

* The same method had previously appeared in the Treatise on Mechanics in the Library of Useful Knowledge, understood to be the work of Dr. Lardner.

to one or two of the pulleys with more than one rope, and shall for this purpose select the Spanish burton. We must employ a figure.



Taking up these instruments in order: in the first of them the rope to which the power is attached must, by the principle of tension, be stretched equally by the weight in every part, and must, therefore, suffer the same tension from the weight at the fixed end, and at that to which the power is applied. The fixed support and the power must, then, be equally engaged in supporting the weight. This rope alone considered, then, the ratio of power to weight in order to produce equilibrium, must be 1 to 2. But the block A is in the same situation with that in the fixed pulley, and must, therefore, sustain the united tensions of the power and that part of the weight which it supports; or, in other words, a tension equal to *twice* the power. This tension being communicated to the second rope, must be met, in order to produce an equilibrium, by an equal force in the weight: the number 2 must then be added to that found above, and 1 to 4 will be the true ratio of power to weight.

In the second of these pulleys, the rope to which the power is attached, being in the state of a fixed pulley, by means of it, a part of the weight just equal to the power will be supported by the power; and, this rope alone considered, the ratio of power to weight, in order to produce equilibrium, would be 1 to 1. But the block A being in the situation of the corresponding block in the first burton, sustains the united tensions of the power and that part of the weight which the power supports by the first rope; which tension is equal to *twice* the power. This being communicated to the second rope, must be met in order to produce equilibrium by an equal force in the weight. But by the principle of tension, both the fixed end of the second rope and that at A must be equally stretched; the fixed support and the force acting at A, equal to 2 (*twice* the power,) must then be *equally engaged* in supporting the weight, and will, therefore, both together, support a part of the weight equal to 4. This number being added to 1, which gave the ratio of weight by the first rope, gives 5 for the real value of the weight in terms of the power 1, in the case of equilibrium.

A student believes that he has thus presented an exact specimen of the application of the *principle of tension* to a few of the principal cases. The author is not, he thinks, in the present work, as clear in his analysis of the subject as in that presented by him in the Library of Useful Knowledge.

A Student.

The Elements of the Differential Calculus; comprehending the general theory of curve surfaces and of curves of double curvatures; intended for the use of mathematical students in schools and universities. By J. R. YOUNG, *author of "The Elements of Analytical Geometry," revised and corrected by* MICHAEL O'SHANNESSY, A. M.

We congratulate the lovers of mathematical science on the appearance of the above work. Mr. Young's treatise on algebra had raised high expectations; these have been fully realized in his work on the elements of the differential calculus, and we look forward with deep interest to the other treatises announced from the same gifted pen.

A complete work on the differential calculus has long been wanted in this country; we are glad to learn that even in England such a treatise is received with favour, we see in it nothing of *fluents* and *fluxions;* the doctrine that increase and diminution require motion is studiously avoided.

The writer of this notice recollects well the time when, at one of the most ancient and best endowed universities in the union, he was desirous of studying the differential and integral calculus, he applied to the professor of mathematics for advice, and was informed by him that no book on this subject had been published here—that if he wished to cultivate the subject he would do well to study Euler's treatise on the calculus of infinitesimal quantities. In consequence of this suggestion he procured Euler's Treatise, consisting of near eight hundred pages, in the Latin language, and after a laborious perusal of the works, he learned that it treated of quantities which were at the same time equal to 0, and greater than 0, or less than 0—that one quantity infinitely great might be an infinite number of times greater or less than another quantity also infinitely great—that quantities infinitely small were equal to 0, that an infinite number of such quantities might have a finite value greater than 0. Perplexed with this metaphysical view of the subject, he concluded, in the language of Lear, that "nothing can come from nothing," and abandoned the study in despair. The subsequent publication of Bezout's treatise on the differential and integral calculus, a beautiful piece of composition, but too concise to do full justice to the subject, afforded encouragement for a renewal of the study. These remarks have been made to show what advantages for the study of higher mathematics were furnished in our universities ten years ago. The want of fit text books, and of competent teachers, threw a langour over the efforts of the students. No science can have many votaries in any country so long as its rudiments are locked up in a foreign language:—it is only by dissemination of publications in our native tongue, we will even say of books printed on this side of the Atlantic, that the study of higher mathematics, or indeed of any of the sciences of which the list has of late years been so widely extended, can be made to flourish

and engage the interest of the mass of aspirants for distinction in the different universities and colleges throughout the country.

Our enterprising booksellers, Messrs. Carey, Lea, & Blanchard, have removed this inconvenience by placing before the American public two of the best treatises in their several departments with which we are acquainted. Of the algebra it may be said that it is more complete than any to which we had access before; of the calculus we must say that it is indispensable, it is the only key which is furnished us by the American press for the interpretation of works in the higher departments of mathematics. We believe that this work contains all that can be desired on the subject of the differential calculus, and, if followed by as good treatises on the integral calculus, on geometry, and the application of algebra to geometry, will furnish the student who shall peruse them attentively, with all the previous knowledge requisite for commencing the highest department of mathematics, that of analytical and celestial mechanics.

Perhaps the student for whose perusal this book is offered will inquire whether the calculus, as here illustrated, is easily comprehended? Has Mr. Young succeeded in making this study more popular than his predecessors have done? We will inform him that the subject is here made as simple and as popular as its nature admits. An easier treatise might have been made, but when studied with the utmost care, it would have left the student in ignorance of many important principles which this book illustrates, and without which further progress in pure mathematics would have been very inconvenient. We could have wished for a few more practical examples, though even in this respect the author has the advantage of all who preceded him. The great fault of former works on this subject, in our opinion, has been the want of examples for the exercise of the active powers of the learner. This defect is common to all new studies: the storehouse of practical questions has never been filled. The precepts have been given, and the learner has been left to illustrate them in his own way.

Mr. Young's book contains many new and ingenious solutions, and a good number—we wish it had been greater—of questions without solutions. On these the student will have ample opportunity for the exercise of his own ingenuity. If he is desirous of solving more examples, we would refer him to the formulas and problems of Meier Hirsch, which have lately been translated into English, and published in this country. For those who are not fond of making original solutions, but are willing to peruse the solutions of others, and thus become acquainted with the literature of mathematics, this beautiful treatise will afford a rich fund of information, and will amply reward their labours.

S. C. W.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER, 1832.

With Remarks and Exemplifications, by the Editor.

1. For *Bungs for Porter and other Casks;* Robert Barlow, city of Philadelphia, December 1.

This bung is to be made of cast iron, and in the top of it there is to be a dovetailed mortise, into which three pieces of iron are to fit, and to be connected by means of a ring and bolt, exactly like the Lewis for raising heavy stones. By means of this ring, through which a lever is to be passed, the bung may be readily drawn. The claim is to the iron bung, and the application of the dovetail pieces above described.

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2. For *Making Wine from Apples and other fruit;* Jacob Hugus, Hempfield, Westmoreland county, Pennsylvania, December 1.

This is not the first time we have heard about making wine out of cider. A negro belonging to a wine merchant in Philadelphia, once observed, that he was sure his master would soon break, and on being urged to tell the reason, he replied that he laid out almost all his money for cider, and never sold a drop. Notwithstanding this, however, the merchant grew rich.

The patent before us is for preserving cider, and the juices of other fruits, and converting them into wine, by the means of a "quintessence" which will prevent them from becoming acid. This *quintessence* is to be obtained from apple brandy, or rye whiskey, by distilling it until its proof is so high that ten gallons of it will require seven or eight of water to bring it to first proof. Into every barrel of the cider as much of this quintessence is to be put as would make five gallons of proof spirit, and a little more may be added after a year or two—"when the sap rises and the trees are in bloom." "The cider must be made in the decrease of the moon;" there are, besides this, several other lunarian influences, which appear to have governed the author of these new inventions and discoveries, as they are set forth in several parts of his specification. To his discoveries and improvements he lays no claim.

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3. For a *Percussion Primer for Cannon;* Joshua Shaw, city of Philadelphia, December 3.

(See specification.)

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4. For a *Compression Cannon Lock;* Joshua Shaw, city of Philadelphia, December 3.

(See specification.)

5. For a *Portable Cannon Lock;* Joshua Shaw, city of Philadelphia, December 3.
(See specification.)

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6. For an improvement in *Casting Iron Hubs* for Wheels; John Thurston, Providence, Rhode Island, December 3.

The improvement claimed consists in making a perfectly true and smooth core of iron to form the box. Upon this the hub is to be cast, and removed from the mould whilst hot, when the core may be driven out by striking it on the small end. The patentee says that he is aware that metallic cores have been used in small castings, and that he claims as new only the application and use of them in casting wheel hubs; ought we not to be informed at what size his patent begins to take effect?

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7. For a *Plough and Harrow;* Henry Higley, Canaan, Litchfield county, Connecticut, December 4.

This plough and harrow is made in the usual form of the instrument sometimes called a cultivator; it has a coulter at its front angle, formed much like the teeth of some of these instruments, with a ridge along its centre, to turn the earth on either side. The teeth on the two side bars of the V are straight, like those of common harrow teeth.

The claim to the foregoing machine is "in the using this share as described, and the combination of the whole as uniting the properties of the plough and harrow.

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8. For *Machinery for Cleaning Fur;* Charles Lockwood and Ransom Lockwood, of Weston, and John Arnold, of Norwalk, Fairfield county, Connecticut, December 4.

It always affords us real gratification when we meet with an apparently good machine so described as to be likely to secure to the inventor his rights, and such appears to be the case with that before us. The object in view is to separate the fur and hair from each other after they have been cut from the pelt. A machine is described which the patentees say they have had in use with beneficial results, and they indicate different modes in which the same principle may be applied, resting their claim upon the principle of action, whether applied as they have done it, or in any analogous way, which produces the same effect.

The invention is founded on the principle that the barbs, or asperities, contained on hair, give to it a tendency, when agitated, to travel back in such a way as will cause it to enter between the fibres of any kind of cloth, and to pass through it. A principle, in fact upon which the process of felting is entirely dependent.

The machine which they use is an oblong box, supported on a suitable frame, the sides of the box are lined with tin, or otherwise so made that the fur will not adhere to it, whilst the bottom is made of cloth, into which the hairs are to be forced to pass. Within this box re-

volve a number of whippers, attached to shafts, which serve to agitate the fur, keep it hollow, and prevent it felting. The machinery by which the shafts are turned operates also upon the cloth bottom by a kind of twitching motion, alternately relaxing and straining it, which causes the hairs to enter and pass through it.

It is proposed sometimes to send the fur through a revolving machine, formed like the boulter of a flour mill, and covered with cloth, having whippers revolving in it, and beaters acting upon the outside of it, in order to produce a result analogous to that obtained from the twitching motion before spoken of. Other modes are pointed out, all of which are considered as mere examples of the many forms which may be given to the apparatus, whilst it remains essentially the same, the claim being to "the agitating in any manner the mixed mass of fur and hair, and causing their separation by the inherent and natural qualities of the hair when thus agitated in contact with the cloth."

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9. For a *Lamp for burning Tallow, Lard, Beeswax, or other concrete oils;* Norman Rublee, Montpelier, Washington county, Vermont, December 4.

It is proposed to make the body of this lamp in the form of a common tumbler, with the cover, or upper part of it, convex. Tubes with wicks are fixed in its centre in the ordinary way, and within the body of the lamp there is a cup which is open at top, and may be about half the height of the shell, or external case of the lamp. This cup is borne up by a spiral spring, so that its upper edge is kept in contact with the cover of the lamp; from the centre of this cup a wire, which may be of copper, ascends and passes through a hole in the centre of the burner to which the tubes are attached; this wire is to rise so high that the flame of the wicks may heat it, which heat descending down melts the concrete matter, being aided also by that portion which it communicates to the cup and wire spring to which it is attached.

When the lamp is to be filled, the wax, tallow, &c. in a melted state, is to be poured into it, so as not only to fill the cup, but the body of the lamp also. When the material is partly burnt out, and becomes too low in the cup to supply the wick, the wire heater is to be pressed, which, causing the cup to descend, will again fill it, and, when the pressure is removed, the action of the spiral spring will restore it to its place.

The points depended on "are the construction of the cup, spring, and heater," by which "the great difficulty of the tallow's getting low, and beyond the influence of the heat, is avoided." This combination we believe to be new, although the heater alone is not so, a copper, or other wire, having been frequently used to keep tallow, &c. in a melted state for burning in lamps.

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10. For a *Cock to prevent Water from Freezing* in a Pentstock, or Branch Pipe; Dixwell Lathrop, jr., Norwich, New London county, Connecticut, December 6.

This invention, like the last, is very well described; but unfortu-

nately for the patentee, if he is a *true*, he is far, very far, from being the *first* inventor of the thing described; we do not suppose that it is "as old as the hills," but it was a familiar acquaintance of ours thirty years ago, at least; we had it then in use in Philadelphia, as had hundreds of others.

The object of the contrivance is to let off the water which would otherwise freeze, in an ascending pipe; and this is effected by means of a cock placed sufficiently low in the supply pipe to be out of the reach of frost. To those of our readers who are not acquainted with the thing, the following description may be acceptable. Suppose a waste-cock to be placed sufficiently low down in the supply tube, and the key to be so turned as to allow the water to pass through it, and, while it is in this position, a hole be drilled through the side of the cock, and into the water way of the key; if you then turn the key half way round, the water will pass freely as before, and the drilled hole through the key being against the imperforated side of the cock, no water will escape through it; but if you then turn the key one quarter round, so as to present the hole drilled in it to the rising pipe, the cock will be turned off, and the water in the rising pipe will escape through the drilled hole into the water way of the key, and out of the drilled hole in the body, or shell, of the cock. This water may be thence conducted through a descending waste pipe into the ground, or elsewhere.

From the arrangement above described the patentee has not departed in the slightest particular.

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11. For *Machinery for making Window Sashes, &c.;* Charles Thompson, Poughkeepsie, Dutchess county, New York. First patented December 6th, 1830. Surrendered and reissued on an amended specification, December 6th, 1832.

When this machinery was first patented, a model was prepared showing in detail its various parts; but the distinct instruments by which the various operations were performed were so placed as to obscure each other; from this model a drawing was made in one point of view only; the references to it could not, therefore, afford a sufficiently clear explanation of the whole; the claims, also, were not clearly presented. To cure these defects, was the object of the amended specification.

This is not the first machine invented for the same purpose, but we are of opinion that it is the best. We are informed that it has been in actual operation for a considerable length of time, with results which are perfectly satisfactory. It would be in vain to attempt a lucid description of it without several engravings.

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12. For a *Cooking Stove;* Henry A. Foot, Dover, Strafford county, New Hampshire, December 7.

We cannot supply the hiatus left by the patentee in his specification, in which he has not made any attempt at pointing out the no-

velties of his apparatus. There probably may not be another stove with the corners rounded to the same circle, or the partitions and openings for pots and kettles arranged precisely in the same way, and that is all we can say for it. We hope that the heat which it affords may greatly transcend that of the light diffused by the specification or description of it.

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13. For an improvement in the *Machine for preparing Cotton Roving;* John A. Bradshaw, Foxborough, Norfolk county, Massachusetts, December 8.

Without the drawings we cannot give a clear idea of the proposed novelty, which consists in the application of a spring to the flyer, in such a way, and so constructed, as to give a slight degree of twist and condensation to the roving; a purpose which persons acquainted with the subject are aware has been accomplished in various ways.

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14. For *Glass Hones for Razors, &c.;* A. Gordon, and John P. Bakewell, Pittsburgh, Allegheny county, Pennsylvania, December 8.

Such a form is to be given to rods of glass as may be deemed best, a convex surface, however, being preferred to a flat one. The faces of the glass hone are to be "rough, ground, or frosted, by any of the usual means, and a grain differing in fineness may be given to the respective sides." Upon the glass hone, so prepared, the razor is to be rubbed in the usual way, the hone being first moistened with water or oil. The claim is to the application of a new material, glass, to the making of hones. A slight trial, upon a roughened glass tube, afforded us a very favourable result.

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15. For a *Thrashing Machine;* Jesse Bevier, Sempronius, Cayuga county, New York, December 11.

This thrashing machine is to be used not only for thrashing grain, but also for grinding [or hackling] apples. There are to be bars and spikes on a cylinder, and bars and spikes on a concave, and the improvement claimed is "the bars and spikes of the cylinder acting upon the grain over the concave of bars, and over and between the spikes in the concave at the same time; and also the application of the machine to grinding apples."

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16. For an improvement in the *Water Wheel;* James M'Connel, Shenango, Mercer county, Pennsylvania, December 13.

The patentee claims, in the action of his wheel, the conjoint operation of three powers, all derived from the descent of the water; it is to be a horizontal, reaction wheel, receiving the water on its upper, and discharging it on its lower side. There are to be eleven buckets, extending from the periphery of the wheel towards its centre, about one-half the semidiameter; the buckets are to be curved from the top to the bottom in such a way as to deliver the water advantageously in its exit. The wheel is, of course, to run in a penstock, with a

suitable curbing, to direct the water. The buckets overlap about six inches, at their outer ends, that is, a line drawn perpendicularly from the lower edge of one bucket, would cut off about six inches of the contiguous bucket. Not only the number of the floats or buckets, but the precise dimensions of every part, are given; a detail into which it is not necessary for us to enter.

We are told that this wheel will run in back water with more facility than any other, and that it is particularly adapted to places where the head is low, and the wheel liable to be flooded. The three powers which act upon it are thus set forth by the patentee; he says that the water issuing from the bottom of the wheel propels it upon the principle of reaction; that the water being let on at the upper side, and running with the wheel, and striking the buckets nearly at right angles, propels it upon the principle of percussion; and that the water in passing down through the wheel, acting on the inclined surface of the buckets, gives a third impulse on the principle of gravity. The claim is to the practical combination of these three principles of percussion, gravity, and reaction, used at one and the same time.

We are unable to trace the particular and special coadjutorship of these three principles in this wheel, and could as readily ascribe them to several others; we are, however, so much inclined to resolve all these modes of action into gravity, and to view them as merely different methods of applying this property of matter, as not to acknowledge the employment of any other power in the propelling of water wheels. Reaction and percussion we esteem as the children of gravitation, and would never commend their employment when the fall of water is sufficient in height to enable the millwright to fill the buckets of an overshot, or pitch-back wheel; that is, when it is necessary to husband power.

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17. For improvements in *Abstracting heat from the smoke of air heaters, and of applying basket grates to such heaters;* Daniel Steinhauer, city of Philadelphia, an alien, who has resided two years in the United States. December 13.

(See specification.)

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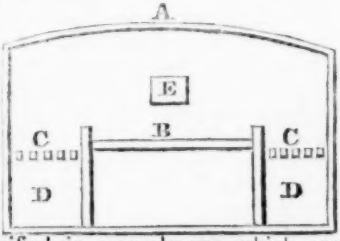
18. For *Making and manufacturing Iron by the use of anthracite or stone coal, and for a Furnace used therefor;* Norman Callender, Iron Master, Cumberland county, Pennsylvania, December 14.

The inventor of the furnace described in the specification of this patent, represents it as applicable to the manufacturing of sheet, boiler, rod, hoop, and bar iron of all descriptions, and also to the melting of iron for making castings of all kinds. The furnace is to be nine feet long, and three wide; the chamber between the fires, however, is widened out in the centre to nearly four feet, by the curvature of the side walls. For sustaining the fuel there is a grate at each end of the furnace, extending across it, and occupying two feet of its length. Beside each grate a wing wall is extended across, like those in the

ordinary air furnace. Under each grate there is an air chamber, eighteen inches in height, and air is to be forced into these in the usual way, which being diffused through the chamber, acts with equal power on every part of the fuel upon the grates; these air chambers answer the purpose of ash pits. The roof is an arch, sprung from the ends, with a rise of six inches. The various openings into the furnace must be adapted to the purpose for which it is to be employed; the heating of sheet iron, for example, requiring a wider opening than either of the other objects.

The patentee claims the use of anthracite in the manufacturing of iron, as above, through all its stages, from pig to bar iron, in all its variety of forms and descriptions; and also the melting of cast iron for foundry purposes, without bringing the coal into contact with the iron. He claims, likewise, the furnace as above described, to be used in, and applied to, the said purpose.

The subjoined sketch will give some idea of the form of the furnace, A being the roof; B the floor, C C the grates; D the air chambers, and E the charging door. The peculiarities of this furnace are undoubtedly the proper subject of a patent, but the broad claim which is made to the exclusive right to the employment of anthracite in the various operations specified, is scarcely one which can be sustained, as this same fuel has been already and extensively employed for some of the purposes named, and its application to the others frequently essayed.



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19. For a *Process of manufacturing, and dyeing with, the Alkaline Prussiates;* Felix Fossard, of the city of Philadelphia, an alien, who has declared his intention to become a citizen of the United States. December 14.

(For account of this patent see page 182.)

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20. For a *Machine to be used in the art of Blowing Glass;* Joshua Laird, Pittsburgh, Allegheny county, Pennsylvania, December 14.

The machine above named is intended for blowing glass knobs for bureaus, and other detached pieces of glass, which are blown in moulds; the main part of the invention consists in the application of a forcing, or condensing, pump, to the blowing of articles of the foregoing description. A table of a suitable height, has a top formed of a plate of cast iron, upon which are proper fixtures for sustaining the mould into which the detached piece of glass is placed. The cylinder of the pump is secured vertically at one end of the table, and the air from it is conveyed through a leaden, or other flexible, pipe, to a hole the centre of the table, exactly under the mouth of the mould; a

pipe, or nozzle, of brass, or other metal, attached to the flexible tube, passes up into the glass to be blown, and is retracted when the operation is completed, it being attached to a jointed handle, fixed for the purpose below the table. The mould, and its handles, are made in the usual way, excepting a cap plate, attached to the table, and which turns back upon a joint, when the mould is to be removed. The centre of the under side of this plate is excavated so as to form the upper part of the mould, and is perforated so as to admit a pin to pierce the knob.

The claim is to the application of the pump in the blowing of glass, and to the crown, or cap piece, as above described.

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21. For a *Back for a Forge*, or other fires in which a blast is used; Asa Graham, Hamilton, Madison county, New York, December 15.

This *improvement* in the backs of forges we think very inferior to that described at p. 165, vol. x. A cast iron box is to be made, one face of which is to form the back of the forge; from the lower side of this the tuyere, cast in one piece with the plate, is to project. The wind is to be blown into this box through a tube on the opposite side, and near its upper edge. This, we are informed, is more simple than the box with an intermediate plate, such as is described in the article above alluded to, which it must be confessed is perfectly true, but, at the same time, we apprehend that the simplicity is attained at the expense of utility, and that its adoption is proposed without an adequate acquaintance with the principles upon which the efficiency of a blast depends. In the arrangement now proposed, the air will be less heated, and consequently, the front plate less cooled than in the former arrangement; now it has been found that the efficiency of a blast depends in a great degree upon the heat of the air introduced among the fuel, and that an important modern improvement in blast furnaces consists in heating the air highly before it is admitted among the fuel; for some facts on this point the reader may turn to vol. x. p. 130.

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22. For an improved *Water Wheel;* Sandford Reynolds, Pitcher, Chenango county, New York, December 15.

We do not fully understand the description of this wheel, although it is accompanied by a drawing better executed than many which pass in the patent office. It is termed, on the head of the drawing, a *Coaction-wheel*, and we suppose that, like No. 16, it is to be coacted upon by gravity, impulse, and reaction. A vertical cylinder, surrounded by buckets, which appear to form radii with it, runs in a hollow cylinder, which has four openings in it directing the water tangentially on the wheel, and thus propelling it. The buckets, we are told, are to be curved, but whether this is for the purpose of giving them a helical twist upon the cylinder, we do not know. There is no claim made.

23. For a *Cooking Stove;* Henry Stanley, Poultney, Rutland county, Vermont, December 17.

The part of this stove which is to contain the fuel is of a square form, and made of cast iron. Instead of the kind of top usually employed there is to be a circular plate of such size that only about one-third of its area will lie over the fire chamber, or body of the stove, the remaining two-thirds projecting beyond it. This is covered by a second plate, supported by a rim, which rises it from the first circular plate. By means of cogs upon the edges of the upper plate, it may be turned round, whilst the lower plate remains stationary, a pinion and crank being fixed for that purpose. A chamber, for smoke and heated air, exists between the two plates; and these are conducted off through an opening in the lower plate and in the rim. The upper plate is perforated to receive pots, kettles, and other cooking apparatus, and a large tin cover, operating as a reflector, is provided to cap the climax. The claim is to the revolving top plate for receiving the various cooking fixtures.

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24. For a *Fanning Mill;* John W. Hunter, Morgan L. Hunt, and Sullivan Holman, the two former of Oakland, and the latter of Senacoe county, Michigan Territory, December 18.

The three gentlemen to whom this patent has been granted, have, it seems, invented, or contrived, something new in the mode of shaking the screen and sieves of the ordinary fanning mill. The manner of doing this is described at great length, but the accompanying drawing presents nothing more than an external view of the instrument, without written references, or the exhibition of the shaking apparatus. To what extent this is to be lamented we are unable to say.

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25. For a *Machine for Picking, Curling, Twisting, and Untwisting Hair for Mattresses;* Jason C. Osgood, and Asahel Green, Eaton, Madison county, New York, December 18.

There is no claim made to this hair twisting and picking machine, yet, in the twisting part, we see but little difference between it and those which we have known in operation. The picking part consists of a cylinder, or drum, turned like a grindstone, and having projecting spikes, or wires, on its periphery, which work between others on a concave, the hair being fed to it by an endless apron, in the manner of some thrashing machines. There are some particulars noticed which we do not think it necessary to point out, as not being of importance in themselves, and especially as we are left in the dark respecting the intention to include them in this patent.

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26. For the *Application of Cork to the filling of Beds,* and other useful purposes; Stephen Bates, Boston, Massachusetts, December 25.

The cork is to be first dried, and then ground, or grated, to reduce it into pieces the size of a walnut, and smaller. When so pre-

pared it is to be used for all the purposes of stuffing to which feathers, wool, hair, &c. are applied. Beds, mattresses, and pillows, so stuffed will, we are told, serve the purpose of life preservers, in case of disaster in steam-boats, and other vessels.

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27. For a *Vertical tortive wire door spring;* John Codman, city of Boston, Massachusetts, December 28.

The point, or part, claimed in the specification of this patent, is not that which the title would indicate; and that part of the apparatus which is claimed as new, is described in such a way as would seem to confine the inventor to the exact form and arrangement given by him. The door spring is to consist of a piece of wire about twice as long as the height of the door. This wire is to be doubled, leaving a loop at one end, which may be hooked upon a metallic plate screwed on to the door, near its bottom, and to the hinged joint. The wires are to be lightly twisted together, making one turn round each other in about a foot. An apparatus, called the graduator, is to be fastened on to the door casing, just above the hinge joint of the door. Into a wheel having teeth upon a projecting rim, formed in the manner of a crown wheel, the two ends of the wire are to be secured, about five-eighths of an inch apart. When the wheel is turned upon its centre pin, as it stands horizontally, the twist of the wires will be thereby regulated. The teeth surrounding the wheel are to receive a pin to retain it in any required position. The claim is to "the regulating box, and the teeth and groove of the regulator, and the application of them."

The thing to be effected is so simple, and the modes in which it may be done so numerous, and some of them so much less complex than the one proposed, that a claim so restricted appears to be of little value.

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28. For an improvement in the *Process of Tanning Leather;* Edward Evans, Salem, Westmoreland county, Pennsylvania, December 28.

It is proposed to dispense with the use of lime, and likewise with the process of sweating, by one or other of which the hair is ordinarily removed in the preparatory process of tanning; and also to complete the operation in less than one-half the usual time. The patentee calls his improved mode "the vegetable fermentative process of tanning."

Into each of four barrels is to be put a bushel and a half of chopped Indian corn, or other grain; or, in lieu of these, an adequate quantity of any vegetable matter, which will undergo the vinous fermentation, to produce which a suitable portion of scalding water and yeast are to be employed; when this process has commenced the contents are to be emptied into a vat prepared by being half filled with clean soft water; the ingredients are to be stirred, and the vat covered, so as to renew the fermentation. Hides which have been well soaked and fleshed are then to be put into the vat, and occasionally handled,

until the hair is loose, which, under proper management, will be in a few days. When they have been haired, and again fleshed, they are to be replaced in the fermenting liquor, and worked out in the course of a day, or so. They are then prepared for handling in strong oose, into which a barrel of fermented liquor has been poured; after a week they are to be laid away in strong leaches, containing also a barrel of the like liquor.

The claim is to the applying the principle of vegetable fermentation in the manner described, throughout the whole process of tanning.—Experience is the best tutor; if the process answers well, we have nothing, therefore, to say against it, although its theory may appear to be a little mystical.

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29. For an improvement in *Water Wheels;* Henry Crenshaw, Anderson District, South Carolina, December 28.

The patentee calls his invention a *multiplied water power*, and says that it consists in "the repeated application of water to a number of wheels in succession." Instead of allowing the water of a given head to act upon a single wheel, the patentee proposes to carry the water down an inclined plane, in the form of a trough, and to have a succession of undershot, or flutter wheels, one behind the other. He supposes, by way of exemplification, that there is a fall of ten feet, and states that there may be then an inclined plane of one hundred feet in length; on such a plane from twenty-five to one hundred wheels may be placed, as they may vary from one to four feet in diameter. From the shaft of each wheel, bands are to be extended to a main shaft carrying a fly wheel. The superiority of this plan over that of a single wheel is said to be that the desired velocity for sawing, grinding, &c. may be at once obtained.

We could scarcely think of a more certain mode of diminishing the power of falling water than by dividing it in this way; its own friction against the plane or trough, the friction of so many axles, the bending of so many bands, and the keeping of so many parts in order, will consign this invention to early oblivion, excepting the outlay which it may occasion should, for a time, serve as a momento that such a thing once was.

In point of novelty, we will remark that the using of wheels in succession, and the gearing them so that they shall concur with each other, have been repeatedly done, although not in the mode prescribed by the present patentee. It has been adopted principally where there has been a high fall, and a small quantity of water, rendering it impossible, or inconvenient, to make a wheel of sufficient diameter to apply the whole power at once.

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30. For a machine for *Making Stock Brick, Tile, &c.;* David Flagg, jr., city of New York, and Amos Parker, Sweden, Oxford county, Maine, December 28.

In this machine we do not perceive any thing new in principle, and but little variation in point of arrangement from other machines

now in use. A vertical shaft is to be turned by means of a sweep, a tub surrounding the shaft at its lower end; arms extending from this shaft, work between others on the sides of the tub, and by these the clay is to be mixed. Openings are left on opposite sides for the clay to pass out into chambers, from which it is to be pressed into moulds by means of lever power. The moulds are placed on carriages carried backward and forward by a rack and pinion.

The claim is to "the manufacturing stock brick, tile, &c. at one operation, as above specified."

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31. For a *Machine for making Shingles, Staves, Heading, &c.;* David Flagg, jr. city of New York, December 28.

This machine is intended to be driven by a water wheel, a crank from which works a lever beam, carrying at its opposite end a frame, sliding between fender posts, to which frame a knife, or frow, is attached, which cuts the shingle from a bolt firmly secured upon a bed. The shingle, when cut, is forced edgewise between two knives, by means of a follower. To give the proper taper to the shingle, the knives are nearer together at one end than they are at the other. Fixed saws are used to score the shingle crosswise, which shortens the shaving, and thus enables the knives to shave it readily. These operations, or, rather, the means of performing them, are not clearly described, and, in fact, the details of the whole machine are in many points obscure.

The claim is to the machine generally, and to the vibrating beam to work the gate; the latter with its frow, or knife; the mode of securing the knives; the peculiar construction of the driver; and the saws used to score the shingles.

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32. For a *Portable Horse Power*, for propelling machinery; David Flagg, jr. city of New York, December 28.

The claim made in this patent is to "the peculiar arrangement of the several parts of the portable horse power, for propelling machinery." This machine has one merit at least, in not claiming to gain power, as is the case with several of its predecessors. A vertical shaft is to be turned by a lever to which a horse is attached. The peculiar arrangement consists of the wheels, pinions, and shafts, by which the motion is communicated below, instead of above, the horse-walk. We suppose that it is from this construction that it derives the name of portable, as it occupies less space than the common horse mill, and may therefore be more readily packed up, and transported to a distance.

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33. For a *Machine for making Wrought Nails;* John V. Green, city of New York, December 28.

We have before alluded to a similar machine, in vol. viii. p. 114, of this Journal. Had the patentee copied the drawing given in the *Recuiel Industriel*, the likeness could scarcely have been more perfect. For a description of it our readers must turn to the foregoing article,

as the present specification does not present any greater novelty than would be presented by a claim to a fork with three prongs. The things now proposed to be made are nails; in the patent alluded to it was horse shoes; in the original machine we get back again to nails.

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34. For a *Plough;* East Russel, Fairfield county, Ohio, December 28.

It appears that the improvement in this plough consists in a loop by which the sheath is made fast to the land-side of the plough, rendering, it is said, "the whole architecture of the machine more firm, consolidated and secure, than any other now in use." The patentee also states that he "makes ploughs both right and left handed, and wishes both to be included in his patent."

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35. For an improvement in the *Self-sharpening Plough;* Waldron Beach, city of Philadelphia, December 23.

Mr. Beach is the patentee of a self-sharpening plough, his first patent being dated August 26th, 1823. His present patent is for making a share triangular, and affixing it in such a manner that it may have three cutting edges; he also claims the "securing the reversing point without a bolt. His description is extremely brief, referring entirely to the drawing, without which the particular forms indicated could not be easily explained.

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36. For an improvement in *Building Stoves and Chimneys;* Asa Graham, Rumford, Oxford county, Maine, December 28.

A single flue is to be built from the bottom to the top of the house; the fireplaces are to be built independently of the flue, and something in the form of a Franklin stove, and from each of these, pipes are to pass into this common flue. The fireplaces are to be so constructed as to adapt the stove pipe to them. This comprises the whole *invention*, which the patentee avers he has never seen in use in this or any other country; which declaration we doubt not is perfectly true; but how far he has travelled from his own village, or how closely he has examined what has been done in this and other countries, we are not told, and if left to guess, we should conclude that his reconnoisances have not been very extensive, he must otherwise have discovered many a range of counting houses and stores with flues built in the walls, and stove pipes leading into them, one above the other, from stoves of various kinds.

In what point of view this plan could be considered as an improvement, were it actually new, it would be no easy thing to tell. Where it is followed, it is adopted for economy of room and money, and not because it is equal to that of independent flues for each fireplace.

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37. For a *Double reflecting Baker and Roaster;* Samuel Hascy, Rensselaerville, Albany county, New York, December 28.

Numerous modifications of the common tin bake oven, or kitchen, as it is called, have of late been patented, and in the present case we

have a new recruit in the same company. "The improvement which is claimed as new, is the peculiar formation of the lower reflecting plate, and of the front connecting wire, by which all the necessary apparatus for both baking and roasting are combined in one oven, and is considered as an improvement only on "Dobson's double reflecting baker," "for which letters patent have already been granted."

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38. For an improvement in the method of *Sawing marble and other stone, and cutting or working mouldings, or groovings, thereon, and polishing the same;* Isaac D. Kirk, city of Philadelphia. First patented July 3d, 1832; patent surrendered and reissued on an amended specification, December 28th, 1832.

(See specification, at p. 324.)

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39. For *Clarifying Sperm and other Oils;* Ephraim C. Moss, city of New York, December 28.

The agent employed for clarifying oils of various kinds, is heat, applied through the medium of steam, or boiling water, in any suitable apparatus. The oil is to be put into a tin kettle, which fits into a copper, or other, boiler, by means of which it may be surrounded with boiling water, or steam. A close cover is to be fitted on to the tin kettle, and openings are made for supplying water and oil, and also for the placing of a safety valve. Oil kept at a moderate heat, in this way, will, it is said, be clarified in a few hours, a portion of the foreign matter rising in scum, and another portion precipitating. During the process the rising scum is to be removed. The patentee states that one great advantage of his procedure is, that it can be followed at all times and seasons, whilst the refining of oil by exposure to air and the direct rays of the sun is restricted to fine weather, and limited portion of the year.

This process admits of the use of caustic ley, sometimes employed, in which case the ley is to be thoroughly mixed with the oil before the heat is applied.

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40. For an improvement in the *Bar Share Plough;* Moses Huffman, Elizabeth, Coates county, Tennessee, December 28.

The things described in the specification of this patent consist of trifling variations in point of form, and in the manner of putting some of the parts of the plough together, the insertion of which would not be very productive either of gratification or instruction.

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41. For an improvement in the *Locomotive Steam Engine, and other rail-road carriages;* Colonel Stephen H. Long, of the United States engineer corps, city of Philadelphia, December 28.

There are several different items presented in the specification of this patent, but most of them are described in such terms as to leave the engineer who shall attempt the construction of an engine from the account given of it, a great latitude of means, and to require the aid of some inventive genius on his part. Where this is the case the

things claimed ought to be essentially new in principle; as the particular mode of combining and arranging certain parts, which constitutes the only novelty in many machines, is not relied on. Notwithstanding the known talents and judgment of Colonel Long, we apprehend that some of the things patented by him will not be found to possess all that novelty in principle which will form a secure basis for a patent. The specification is of considerable length, and we are not willing to dismiss it with that kind of brief analysis to which we in general confine ourselves.

The boilers of his engine, which are the first things described, consist of two horizontal cylinders, with one or more flues passing through them, the fireplace being exterior to, and below the boilers. Oliver Evans, it is observed, employed a single boiler of this construction in his steam engine, and others have since applied them to different purposes; but "this mode of construction is believed to be entirely new in its application to locomotive steam engines." We much doubt whether *this application* of what was previously known, constitutes such an invention or discovery as is contemplated by the patent law. If it constituted a part of an existing patent, it could not be used, and if it belonged to an expired patent, or made part of a known invention, it cannot be incorporated in a new patent, although any specific improvement upon it may be.

A boiler consisting of three cylinders, without flues through them, is next claimed; this kind is preferred when the diameter of the cylinder is not more than fifteen inches. The fireplace and broad flue are similar to those employed with the first named boilers, but the chimney, in this latter construction, must be placed at the back end of the boiler. The middle boiler of the three, is made a foot or so shorter than the others, to admit a square flue to connect with the round switch flue above it. A slab of soap stone, or some similar article, is used to intercept the heated air in its passage into the flue, and to compel it to pass immediately under the back ends of the exterior boilers. The three boilers, thus constructed, form the second claim.

The moveable switch chimney used in this engine, is made to turn on hinges, so that it may be laid horizontally in passing through tunnels, &c. This, it is stated, differs from the chimney described in the 4th item of the patentees' specification of June, 1831, in having but a single, instead of two oscillating joints.

A substitute for the force pump of ordinary engines is next claimed; this is designated the *free pump*. It, however, is more properly a reservoir, which is intended to contain water to supply the boiler. This reservoir, or vessel, is situated above the boilers, is closed at top by a dome, and has two tubes leading into it from the boilers, one of them entering into it at top of the reservoir, and admitting steam, the other passing down and communicating with the water in the boilers. Each tube must have a cock, or valve, to open or close it. Water may be admitted into this steam-tight reservoir, and may be heated there, by allowing waste steam to enter a casing by which it is surrounded. When this supply water is to be admitted into the boiler the cocks of both tubes must be opened, and the contained fluid being subjected

to equal pressure both above and below, it will flow freely into the boilers. The patentee states that the principle of this apparatus was described to him by Charles Whetherill, Esq., of Philadelphia, in the summer of 1831, but that he claims the manner of construction which he has described, and especially its use in locomotive engines. For whatever of novelty there is in the arrangement adopted by Colonel Long, he is fairly entitled to a patent as an improvement. The principle of allowing water to flow from a reservoir into a boiler by equalising the pressure upon its upper and lower surface, we have known for several years, and cannot now tell where we first learned it.

In order to dispense with the bell cranks and their appendages, Col. Long states that he has made a compound axle, in three parts; which, however, he has not described, nor is it represented in the drawing; but the model deposited in the patent office is referred to as an exemplification of it. As the model forms no part of the legal description of a patent, and cannot be published, we make it a rule to depend upon the specification and drawings in preparing our analysis, and cannot, from them, give any account of this part of the invention.

A method of heating the water in the *free pump*, by means of the waste steam, and of preserving the heated water resulting from this steam, is next described, not however with reference to any specified construction of the apparatus employed, but only in that general way of which we have before spoken.

A different mode of constructing the wheels from that indicated in the specification of June, 1831, forms the next item in the present patent. The model is here again referred to for an exemplification; but we are informed that the wheel is to be made in part of iron, and in part of wood, the rim, together with its flanches, being cast separately from the hub and spokes, with parts formed upon it to receive the latter, which are to be held fast by bolts, clamps, &c. The spokes are to narrow down as they recede from the hub, but in other points are to be like those described in the specification of June, 1831.

The last claim is to "the successful application and use of anthracite coal" in locomotive engines; nothing, however, is said respecting the mode in which this successful application is effected. We are told merely that it has been used continuously for more than one hour, at a speed of ten miles or more in that time, and with a weight in a train of cars equivalent to five times that of the engine, the road being level, but that the speed will be proportionally decreased should the load be augmented.

If Colonel Long has succeeded, with the ordinary draft, in applying anthracite so as to answer for fuel in long trips, a great desideratum has been obtained by him, as all previous attempts have entirely failed. The difficulty of using this fuel in a locomotive, arises from the coal packing down, in consequence of the continued vibration to which it is subjected, which packing very soon stops the ordinary draft through it. To stir it up will not remove this difficulty, as those who have burnt anthracite well know; it being all important that the pieces of coal, when ignited, should preserve their relative positions. By

means of an artificial blast air enough may be forced through the coal, notwithstanding the packing; and we know of no other means by which it can be effected. This was first accomplished, we believe, by Mr. Phineas Davis, on the Baltimore and Ohio rail-road.

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42. For a *Washing Machine;* Jacob Lindsey, Cannajoharrie, Montgomery county, New York, December 28.

A box, or trough, has a curved bottom formed by framing slats into two strips, which are segments of a circle. A segmental vibrating piece, similarly constructed, is suspended by a rod attached to a pin in a frame above, which pin is the centre of the curvature of the trough and vibrating piece. The two parts do not come into contact with each other, but allow a space between them, to be occupied by the clothes to be washed. This washing machine resembles many others, the main difference being in its having small slats placed at a distance from each other, instead of the rollers usually employed.

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43. For a *Machine for pressing Straw and other Hats;* Otis Plimpton, Foxborough, Norfolk county, Massachusetts, December 28.

The apparatus here described consists, in part, of a suitable block fixed to the frame work of the machine, and upon which the hat is to be placed when pressed, which is done by a heated flat iron; to this a horizontal motion is given by a shaft carrying an eccentric, which acts apon a lever, to the opposite end of which the pressing iron is attached. By placing the foot upon a treadle, the pressure may be regulated in any required degree. There is a number of different contrivances for throwing the machine in and out of gear, and for other purposes, which cannot be shown without the drawing.

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44. For *Fastenings for Bedsteads;* John Richman, Lancaster, Fairfield county, December 28.

The description of this affair is comprised in six lines, but the thing itself may be found in the shops of most of our ironmongers; that is, if it has not gone out of use, and given place to the good, old-fashioned, screws.

A dovetail mortise plate is to be let into the posts, and a projecting piece into the rails, and this, and that, are to be put together, as heretofore.

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45. For an improvement in the *Machine for Kneading Dough;* Nimrod C. Willet, Jonesborough, Washington county, Tennessee, December 28.

Two rollers are to extend across a table, one above the other. The lower roller is to be smooth, and is to be sunk into the table about two-thirds of its diameter. The upper roller is to be fluted and turned by a crank. They are to be about five-eighths of an inch apart.

How much of novelty there is in all this we cannot tell, but the machine is so much like many which we have seen in use, particular-

ly to the south, that we should have hailed it as an old acquaintance had it not been now introduced to us under the sanction of a new patent.

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46. For a *Mode by which the Water which is now usually expended in the passing of canal boats through locks is in great part saved;* Jacob Dewees, Pottsville, Schuylkill county, Pennsylvania, December 28.

(See specification at p. 111.)

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47. For an improvement in the mode of *Drilling and boring out the Wheels of Rail-road Cars;* Dean Walker, Franklinville, Baltimore county, Maryland, December 28.

(See specification.)

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48. For a *Machine for Washing and Drying Clothes;* Thomas Pierce, Hartwick, Otsego county, New York, December 29.

The trough of this machine is triangular within, the horizontal cover forming one of its sides; the ends of the trough, which meet together at the bottom, form the other two sides of the triangle. A lever working on a fulcrum above the trough, and extending beyond its two ends, has two curved pieces mortised into it which descend into the box, and pass through slots in its top; each of them is about a quadrant of a circle. Each of them has a flat board perforated with holes, fixed upon its lower end, and extending along the whole width of the box. When the lever is forced down at one end, the board upon its quadrant will have its face brought into contact with the opposite side of the triangular box, and so of the other end. The clothes placed in this trough, with a due portion of soap suds, are alternately squeezed by these boards against the opposite sides of the trough. This kind of action upon them is undoubtedly better than that of many other washing machines. What is called the *drying* part of the apparatus, is one which is a substitute for wringing. A square box perforated with holes receives the wet clothes, and a follower is brought down upon them by means of a rack and pinion.

There is no claim made, and how far the whole apparatus may be considered as new, we leave to the judgment of those concerned.

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49. For an improvement in the *Machine for Ruling Paper;* Alfred Hathaway, Troy, Bristol county, Massachusetts, December 31.

It is intended, when necessary, to rule the paper on both sides by placing it once on this machine; we cannot without the drawings give a good idea of its construction, and even with them it is not easy to trace the particular operation and arrangement of some of its essential parts; the description not being sufficiently lucid, or the drawings sufficiently in detail.

The claims made are to "the ruling both sides of paper at one operation. The application of the motion to the machine, and the gene-

ral arrangement of the machine, and the operating of it by one person. The peculiar construction of the pens. The application of the pens to the top of the cylinder."

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for a bent Cylinder Primer for Discharging Cannon. Granted to JOSHUA SHAW, *city of Philadelphia, December 3,* 1832.

To all whom it may concern, be it known, that I, Joshua Shaw, of the city of Philadelphia, have invented a conducting, or bent, cylinder primer, for discharging cannon, which is described as follows.

The conducting, or bent, cylinder primer, consists of a hollow tube of any metal or other substance, suitable for the purpose, filled with any of the fulminating powders, or fulminating mixtures, known to chemists, and in use as a priming material for guns in general, or in part with such fulminating mixtures, and in part with gunpowder.

The conducting, or bent, cylinder primer, which is made of any convenient size or length, suited to the gun, or lock, on which it is intended it should operate, may be in length from one to eight inches, and has a short bend at one end, which bend, or arm, may be from a quarter of an inch to an inch, or more, in length; the longer arm, or bend, is made to enter the vent, and to conduct the fire to the charge; the shorter arm, or bend, is made to extend from the vent to any point convenient, and where the lever-hammer, or cock, can be placed so as to act upon it without coming in immediate contact with the vent, by which means the eye and the vent field are relieved from all obstructions and incumbrances, and the sighting of the gun rendered more easy and perfect. I usually make and prepare the conducting, or bent, cylinder primer, after the following manner.

I melt together equal parts of lead and tin, which I form into cylinders by means of a mandrill, and draw-plate, after the usual manner of making hollow cylinders. I then decide upon the length and bend it at the required point, which shall be acted upon by the gun lock. I then fill the whole cylinder with the fulminating powder, and secure it in by closing the metal at each end, and afterwards dipping them into melted wax, or varnish. It is not, however, necessary that the bend, or arm, which enters the vents, and conducts the fire to the charge, should be filled with the fulminating powder, and I therefore, as choice or economy may dictate, fill this portion of the tube, or cylinder, with common gunpowder, which is found to act equally well upon the charge.

When the conducting, or bent, cylinder primer, is required to be used, the longer arm is placed in the vent of the gun, and the shorter arm is conducted by a small groove cut in the gun or vent field to receive it, to where the lever hammer, or cock, is made to strike, for the

purpose of igniting it.—Although denominated a cylinder, the tube may be in any other form.

The advantages secured by this form of primer, are, that it can be acted upon and ignited by a lock far less expensive and less complicated than those in general use, which strike immediately over the vent of the gun. It renders the vent-field free from incumberances, and the sighting of the gun clear of all obstructions.

I claim the conducting, or bent, cylinder primer, made and applied after the manner, and for the purposes, hereinbefore described, whether the same be formed of lead and tin, or of any other material.

JOSHUA SHAW.

Specification of a patent for a Compression Cannon Lock. Granted to JOSHUA SHAW, *city of Philadelphia, December* 3, 1832.

To all whom it may concern, be it known, that I, Joshua Shaw, of the city of Philadelphia, have invented an improved lock for the discharge of cannon, which I denominate the *compression cannon lock*, and that the following is a full and exact description of its construction and use.

Description of the Compression Cannon Lock.

The invention which I claim under this title may be described in general terms, as a lever attached to the gun near the vent, which lever is set in rapid motion by the application of muscular force, and then impinges upon a percussion primer, so as to compress it suddenly—the fire of the primer thus produced, passing along the vent-hole into the chamber of the gun, discharges the cartridge.

The modification which I most approve may be described as follows: it is adapted to the form of primer which is denominated the *bent cylinder*, invented by me.

A small groove, or channel, is cut from one side of the vent-field, to the vent, which may receive and retain one leg of the primer when the other is passed down the vent-hole. A plate, or platform, of metal, about three-quarters of an inch thick, is secured by screws to the side of the vent-field, a little lower than the groove above-mentioned. A shoulder rises on this plate to the level of the vent-hole; its face is towards the butt of the gun, and flush with the forward line of the groove, so that the primer passing along the groove and projecting beyond it, passes also along the face of the shoulder. The lever employed is of the first form; it is a solid square-edged bar of steel, two and a half, or three, inches long, about three-fourths of an inch wide, and one-half of an inch thick; the fulcrum is placed so as to give the limbs the relative length of about three and one. This fulcrum is a stout, well-tempered pin, which passes through the plate above described, and permits the lever to play horizontally on it. The ful-

crum passes into the plate, a little back of the line of the groove extended. When the lock is not in action, the lever lies parallel with the vent-field, its longer arm towards the muzzle of the gun, and it is retained in this position by the pressure of a feather spring: when the lever is brought round so as to be perpendicular with the side of the vent-field, the shorter arm passes, in its revolution, the line of the groove extended, and is arrested by the shoulder. The part of the lever which thus strikes against the shoulder, is fashioned so as to strike it with a vertical edge, or angle. A wire, cord, or other bridle, is fastened at one end to the longer arm of the lever, about three-fourths of an inch from its extremity. The lock, excepting the bridle, is enclosed in a neat brass casing, about four inches long by an inch wide and an inch deep, or thereabout; in which casing, however, is an opening adjoining the groove of the vent-field, to admit the end of the primer, and another opening at the side, to allow the lever to play.

The primer, having been adjusted in the groove prepared for it, and extending into the lock, the bridle, held by the gunner, is drawn smartly towards the butt of the piece; the lever flies round, its shorter arm compresses the primer against the shoulder of the lock, explodes it, and discharges the cannon.

The advantages attained by this lock, consist

1st. In its simplicity of structure, and consequent cheapness of manufacture, and security from accidental derangement.

2. In the small bulk it occupies, and its security against extrinsic injury.

3. In the circumstance that it does not, in any degree, interfere with the sighting of the gun, or with its discharge by any other means; differing in this particular from all other locks in general use.

What I claim as my invention, and for which I ask a patent, is a percussion cannon lock, the main acting part of which consists simply of a lever drawn forward by hand, a part of which lever, or a lip, or piece whereon, compresses, or strikes, upon a *percussion primer*, at a convenient distance from the vent. And this I claim whether the same be constructed in the precise form described, or in any other in which it acts upon the same principle and produces the same effect.

JOSHUA SHAW.

Specification of a patent for a Portable Cannon Lock. Granted to JOSHUA SHAW, *city of Philadelphia, December* 3, 1832.

The portable cannon lock consists of 1. a *trigger*, placed near the handle, or butt, of the stock, acting by means of a connecting wire, or otherwise, on 2, a *gun, or pistol, lock*, on the percussion plan; the cock, or lever hammer, of which, when liberated, strikes on a percussion primer, placed at one end of 3, a *conductor*, or perforated tube of metal, which is arranged at one end to receive and retain the percus-

sion primer, and at the other end to fit against, or into the vent-hole of the cannon.

The gunner, having cocked the lock, places a percussion primer upon the end of the conductor, which is formed to receive it, rests the other end of the conductor upon the vent of the gun, and draws the trigger. The cock, or lever-hammer, falls, explodes the primer, and the fire thus produced passes freely through the conductor and vent-hole into the chamber of the gun, and discharges the cartridge, without the use of a priming wire, or of other priming.

I claim as my invention, the combination of parts above described, by which I attain the several advantages of a cannon lock on the percussion plan, without any of the disadvantages attending locks fixed to the piece, and without the hazard and delays attendant on the use of match, priming wire, and priming horn. I also claim as my invention, the part of the machine which I have denominated the conductor, or the tube by which the fire is communicated to the charge, whether the same is used with the portable cannon lock, or in any other combination, or mode, by which it is made to discharge the vent.

Of the many modifications of which this detached lock is susceptible, I thus describe the particular one which I most approve: it is intended for the discharge of ship guns.

The stock is in the form of a pistol stock, about twenty inches in length. The trigger is placed as on the common pistol, so that the forefinger of the hand which grasps the butt of the stock, may rest on the trigger. The action of the lock is altogether at the further end of the stock; it is included in a metallic case, and the sear connects with the trigger by a communicating wire, or bridle, passing lengthwise through the stock. The conductor is about two inches long, placed at right angles with the axis of the stock, and inserted into the extremity of the lock. The hammer, or cock, has a vertical motion. The primer used in this case, is a modification of the bent cylinder primer, invented by me.

JOSHUA SHAW.

Specification of a patent for abstracting the heat from the smoke and gas of air heaters, and for applying basket grates to such heaters. Granted to DAVID STEINHAUER, *city of Philadelphia; an alien who has resided two years in the United States, December* 13, 1832.

In meditating on the best plan, in an economical point of view, of heating houses by warm air, and from actual experiments made upon the subject, I have satisfied myself fully that by far the most durable of all fireplaces is a basket grate for the fire, when suspended in a cylinder, or air heater, of larger diameter, in such a way that the bottom of the grate and the bottom of the cylinder form the top of the ash pit; allowing the air thence to play freely in the space between the grate and the cylinder, round the fire, yet checking its ascent in that space

beyond the top of the grate, by a ring, or flanch, closing the said space effectually at such height, where a single range of fire brick may be conveniently applied, for the protection of the cylinder, in the immediate vicinity of the fire; while the rush of air below said ring, or flanch, will sufficiently cool the sides and bottom of the basket grate to prevent their being injured by the heat of the fire, though the air may attain such a temperature as will maintain the radiating glow of the fuel, facing the lower part of the cylinder, aiding at the same time the combustion, instead of ascending, unobstructed, at a lower temperature, to the injury of the heat evolved above.

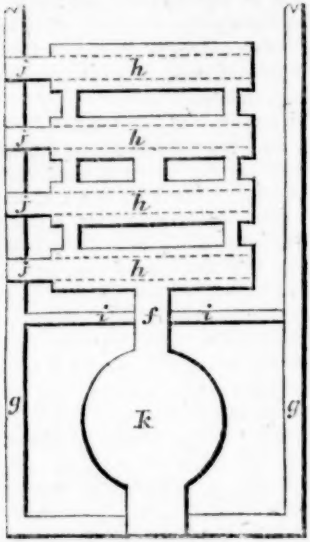
I have in the same way fully satisfied myself that the violent combustion brought about in air furnaces, by high chimneys, is by no means necessary for the limited object of heating air to a moderate temperature. Dispensing, therefore, in such case with high chimneys, and carrying the smoke and gas from the fireplace in a horizontal direction, by the original impulse from the combustion, kept up by a continuation of its operation, I find that the heat of the smoke, and gas, may be abstracted to any desirable extent, by a system of double cased cylindrical smoke drums, placed sideways in succession, as gas retorts, inclosed in a walled air chamber, the one drum receiving the smoke from the other, and each having a separate draft of cold air from without rushing through the interior, while a draft from below is provided for taking up the heat from the exterior of the drums; which various currents of variously heated air, will mix together above, and form a medium temperature, either by themselves, if the air chamber containing them be entirely separate, or with the air heated by the main body of the stove, if the separation be made by a lower partition only; the whole to be distributed thence in the house, by pipes or flues from the air chamber.

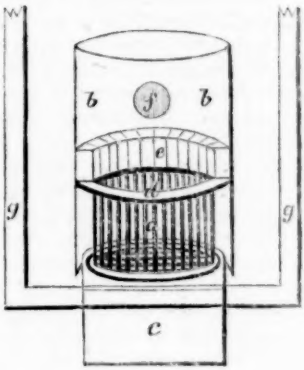
But though the entire heat of the gas and smoke may in this way be rendered available, yet local circumstances, and more particularly the height of the chimney by which the smoke is to escape, must necessarily be taken into consideration in determining the extent to which it may be adviseable, and even practicable, to carry the saving of heat above alluded to.

I thus claim, as my invention for the heating of houses by warm air, the abstraction of heat to any desirable extent, from the gas and smoke of air heaters, by a system of double cased cylindrical drums, placed horizontally, and in succession, as gas retorts, inclosed in a walled air chamber, either entirely separate from the air chamber of the main body of the air-heater, or forming part of it, by a partition not carried higher than the drums, each drum having a separate, cold air flue through its centre, and a separate or common draft from below to strike the outer casing of each, so as to produce a separate rush of air through and from around each drum, differently heated, of course, according to the different temperatures of the gas and smoke in the respective drums, but mixing above into one body of a medium temperature for further distribution in the house by pipes, or flues, from the air chamber.

And with regard to the fireplace itself, I claim as my invention the

particular application of a basket grate, by suspending it in a cylinder or air-heater, of larger diameter, so as to allow the air to play freely in the space between the grate and the cylinder, round the fire, yet checking its ascent in that space, beyond the top of the grate, by a ring or flanch, closing said space effectually at such height.





a, The basket grate.
b b, The cylinder.
c, The ash pit.
d, The ring or flanch.
e, A range of fire bricks.
f, The smoke pipe.
g g, The walls of the air chamber.
h h, The double cased cylindric drums.
i i, The partition wall.
j j, The pipes to convey the air into the interior of the drums.
k, The bottom of the cylinder.

Remarks by the Editor.

In the absence of personal observation upon the effects of the apparatus patented by Mr. Steinhauer, we have availed ourselves not only of a correspondence with the patentee, but also of the information derived from a gentleman, residing in Philadelphia, who has witnessed the experiments with, and the actual operation of, the apparatus described in the foregoing specification. He is a man of practical science; his testimony may therefore be relied on, and it confirms, in all respects, the statements of the patentee, which we will give in his own words.

"The trials made subsequently to those which were witnessed by our mutual friend, have all tended to confirm my opinion of its excellence. The double cased drums exceed my expectation in their power of abstracting the heat from the smoke and gas; and the basket grate, when properly hung, burns the anthracite admirably, and well deserves to be called *indistructible.* I have had one in constant use during the winter in my own house, which shows no trace of the intense fire which has been kept up in it; indeed I am well convinced that it would last twenty seasons as well as one, while I have never known the solid iron cylinder, used for the same purpose, however strong, last more than two seasons, and frequently not even one. The bars of the grate, when the fire is at the hottest, barely attain a cherry red, and consequently do not waste from scaling, while the sheet iron casing is scarcely incandescent in the dark, and therefore never produces that unpleasant smell so much complained of when the air comes in contact with red hot iron.

"In one of my basket cylinders I had, by way of experiment, two bushels of good anthracite put, and well ignited. It was then left untouched for three days and three nights, at the expiration of which time I had the ashes stirred out, and was surprised to find still some glowing embers in the centre, and from the whole quantity of coal not more than one quarter of a peck of unconsumed material."

The patentee is a manufacturer of stoves, and other articles of that description, and is familiar with the various plans of warming public and private buildings with heated air, as practiced in Philadelphia, where much has been done in this way; in many cases with considerable success, but in others, expectation has been entirely disappointed, after the expenditure of much money. In a heated air stove in a private house, it is stated that a quarter of a ton of coal was sometimes burnt in a day, without deriving sufficient heat from it to warm the building. On examination it was found that the heated air, after ascending five stories, escaped at a temperature of no less than 370° Fah. This, no doubt, was an extreme case of waste, but, in general, the quantity of heat, and consequently of fuel, lost, is very great. With Mr. Steinhauer's apparatus, the temperature of the smoke and gas escaping from the chimney, has been found to be but a few degrees above that of the surrounding atmosphere. Hot air chambers, on the ordinary construction, have been altered upon the plan of Mr. S., and the effect of the furnace in many instances doubled, without disturbing the original fixtures.

Specification of a patent for an improvement in the mode of drilling and boring out the Wheels of Rail-road Cars. Granted to DEAN WALKER, *of Franklinville, Baltimore county, Maryland, December* 28, 1832.

To all whom it may concern, be it known, that I, Dean Walker, of Franklinville, in the county of Baltimore, and state of Maryland,

have invented an improved mode of drilling, or boring out, the wheels of rail-road cars, so as to centre them perfectly on the axles; and also in the mode of drilling the pin holes by which they are afterwards attached to the said axles, and that the following is a full and exact description thereof.

The machinery which I use for these purposes, resembles, in its general construction, the slide, or rack lathe, well known to machinists, and my invention consists in such an arrangement and adaptation thereof, as fits it to the particular purpose to which I apply it. The mandril of the lathe by which the wheels are bored out, is made hollow, so that the cylindrical shaft which carries the cutters may slide into it to a depth equal to that of the bored part of the wheel. The wheel is to be centred upon a plate affixed to the mandril, to which I attach it, whilst boring, by means of nuts and screws, or otherwise. The lathe may be driven by a whirl on a shaft which carries a pinion taking into a toothed wheel on the mandril, so proportioned to each other as to produce the proper degree of speed, or in any other way producing the same effect.

The cylindrical shaft, carrying the bits, is sustained upon a slide in front of the mandril, its inner end passing through the part of the wheel to be bored, and into the cavity of the mandril prepared for its reception. The cutters are held in mortices in the shaft; of these there are two sets; the first, of a proper size for boring through the wheels, the second, placed behind the former, to face the wheel as the first passes through.

The cylindrical shaft, with its bits, are made to advance by means of a rack and pinion, to which motion is given from the revolving mandril. Instead of a rack and pinion, however, a screw, or other contrivance, may be employed, so as to force the slide and cutters forward, by force, or power communicated to them from other parts of the machinery.

After the wheels have been put upon the axles, a machine very similar to the former is used for drilling the holes to receive the pins which attach them to each other; the above described mandril, however, not being employed. I usually drill the holes at both ends of the axle at the same time, for which purpose the machine is made double. The ends of the axles, which pass through the wheels, rest on boxes fixed upon benches which sustain the slides carrying the drills. The mandril, or shaft, which receives the drill runs in collars like those of a lathe mandril, and is made to revolve in the same way. The slides are made to advance by means similar to those described for forcing forward the boring shaft, in the first mentioned machine.

I have given the foregoing description of the machinery which I use in order to enable any competent workman to carry the same into effect, agreeably to the modes represented in the drawings deposited in the patent office, but without intending to claim those machines in their general arrangement as my invention; or to confine myself to the exact arrangement there represented; but what I claim as my invention, and for which I ask a patent, is the forcing the cut-

ters and drills forward by means of a rack and pinion, or by a screw or other mechanical instrument producing a similar effect, and having their advancing motion communicated to them by their connexion with the other parts of the machinery, for the purposes hereinbefore described.

DEAN WALKER.

Specification of a Patent for an improvement in the mode of constructing and weighing by the Steelyard Balance. Granted to ERASTUS *and* THADDEUS FAIRBANKS, *St. Johnsbury, Caledonia county, Vermont, September* 22, 1832.

To all whom it may concern be it known, that we, Erastus Fairbanks and Thaddeus Fairbanks, of St. Johnsbury, Caledonia county, Vermont, have invented a new and improved mode of constructing, and of weighing by means of, the steelyard balance, and that the following is a full and exact description of our said improvement.

The main object had in view by us was to adapt the balance, more perfectly than has heretofore been done, to those machines which are constructed for the purpose of weighing loaded wagons and other articles of great weight; but our improved balance is also applicable to such ordinary weighing as is effected by means of instruments constructed on the general principles of the steelyard, or of what is called Dearborn's patent balance, when the same is used for ponderous articles.

We construct a balance in the general form above indicated, but to the extreme end of it we give that shape which is usually given to the points of suspension in a scale beam. This is done for the purpose of hanging thereto a pendulous rod having a flanch at its lower end, or other contrivance, to support weights, to be presently described.

The arm of the balance is divided, and has a moveable poise and hook, formed in the usual way. Weights, bearing a given ratio to each other, are prepared, to be placed upon the flanched rod at the end of the arm. We will now suppose the balance with its moveable poise to be graduated so as to weigh any number of pounds from one to a hundred; the weight to be placed upon the rod may indicate 100, 200, 500, 1000, or any other number of pounds, whilst the moveable poise will point out the number of pounds intermediate between any of the hundreds. These numbers are given merely for the purpose of explaining the principle upon which we proceed in this part of our invention; its applicability to weights of any required amount, and graduated to any scale which may be preferred, will be at once apparent.

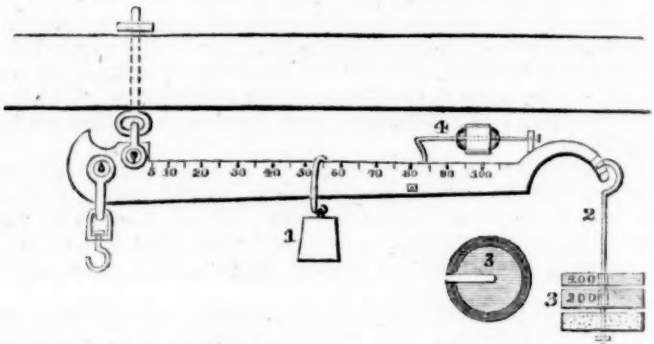
For the purpose of obtaining an exact counterpoise to the platform, and, bringing the beam into the due horizontal position, we attach one end of a screw rod to a standard, usually rising from one end of the

beam, which screw rod extends along in the direction of the beam, towards its fulcrum; its inner end we usually bend down, and curve, so that it may be fastened on one side of the beam, thus removing it out of the way of the hook of the moveable poise. A cylindrical, or other formed weight, is drilled through its centre, and tapped with a female screw, fitting to, and placed upon, the screw upon the rod. This, it will be seen, furnishes the means of regulating the beam with the utmost precision, and with perfect ease. The rod and its weight, stand at a sufficient height above the beam to allow the hook of the poise to pass under them.

What we claim as our invention, and for which we ask a patent, is the combination of the graduated weights to be suspended from the end of the beam, with the ordinary moveable poise, operating in the manner, and upon the principle hereinbefore set forth. We also claim the before described manner of counterpoising the platform, and putting the beam in equilibrium, preparatory to weighing therewith.

ERASTUS FAIRBANKS.
THADDEUS FAIRBANKS.

Fairbanks' Improved Balance.



1. Common poise.
2. Rod to support the Weights.
3. Weights.
4. Adjusting weight.

Remarks by the Editor.

The Messrs. Fairbanks, some time since, obtained a patent for a platform weighing machine, and the foregoing mode of adjusting, and of graduating the beam of the balance, and the weights, was devised by them with a view to its employment with the beforementioned machine. We have had an opportunity of examining one of their balances, and have been much pleased with it; this examination, however, was not necessary to the conviction that it possesses a just claim to the character of a real improvement, the whole arrangement

being so simple, as to enable any person to perceive that it is well adapted to the purpose contemplated, that of facilitating the business of weighing, and more especially that of heavy articles.

¶ TRANSLATIONS FROM FOREIGN JOURNALS.

[TRANSLATED FOR THIS JOURNAL.*]

Method of giving a black and glossy coating to cast iron trinkets, and other articles of the same material.

The desire expressed by some of our subscribers to have the receipt for the varnish employed on the cast iron trinkets of Berlin iron, so called, induced us to request a person conversant with the different processes of the arts, to ascertain the best method of making that varnish. We now give a recipe, not for the varnish itself, but for a black coating which can be applied to any description of cast iron articles. This composition is simple, and offers the invaluable advantage of efficaciously resisting the action of the atmosphere, and even of weak acids, so that the process may be employed for coating a great variety of cast utensils commonly used in our families. The coating easily fixes itself on cast iron, and may also be used on hammered iron, but with less certainty of success in the latter case than in the former.

Attach each of the articles to be coated to an iron wire bent above into a hook, and apply a thin coat of linseed oil; the coat must be thin to prevent the oil from running, forming asperities or knots where it collects. Hang them eight or ten inches above a wood fire, so that they may be completely enveloped in the smoke. When they have been thus exposed to a brisk fire for about an hour, lower them so that they shall be near the burning coals, without touching them; at the expiration of about fifteen minutes remove the articles, and immediately immerse them in cold spirits of turpentine.

Any articles which, after this last operation, may be found deficient in brilliancy, or not sufficiently black, are to be re-exposed to the burning coals for a few minutes, and again dipped in the spirits of turpentine.

This process, which may be variously modified to suit different articles, may, from its simplicity, be extensively applied, and will prove useful in all the cases in which cast utensils are subject to rapid oxidation. [*Journal des Connaissances Usuelles.*

On the Saltpetre of Chili, (Nitrate of Soda.)

A question of some importance to a class of manufacturers, is now pending; it relates to the substitution of nitrate of soda, (saltpetre of Chili,) for nitrate of potash.

* By request of the Committee on Publications.

There are in several commercial towns of France, large quantities of nitrate of soda, imported from the district of Atacama, in Peru. This salt, known as Chilian saltpetre, pays an import duty one-third less than that paid by common saltpetre. Some of the manufacturers of Paris, Rouen, &c. having attempted to obtain nitric acid from this article by the process employed when nitrate of potash is used, obtained unfavourable results. This is owing to the fact that the constituents of nitrate of soda are combined in different proportions from those of common saltpetre, and require different doses of sulphuric acid for their separation. 1263 parts, by weight, of nitrate of potash contain 676 parts of nitric acid, and require 1226 of the sulphuric acid of commerce to separate the nitric acid; the residuum is 1539 parts of bi-sulphate of potash. 1066 parts, by weight, of nitrate of soda, contain 676 parts of nitric acid. To obtain nitric acid from this, 614 parts of common sulphuric acid may be used, and the residuum will be 891 parts of sulphate of soda, or 1228 parts of sulphuric acid being used, the same quantity of nitric acid will be obtained, and the residuum will be 1392 parts of bi-sulphate of soda. Hence it will be readily understood that if the manufacturer treats the nitrates of potash and of soda, with the same doses of sulphuric acid, a quantity of the acid which in the first case would be useless, will in the latter be inadequate. As far as the production of nitric acid is concerned, nitrate of soda would have a decided advantage over the other salt alluded to, since 1263 parts of nitrate of potash, and 1066 of nitrate of soda furnish the same quantity of acid, and as 1066 is to 1263 nearly as 5 to 6, there would be a saving in the raw material by using the nitrate of soda, the two salts being supposed at the same price. With regard to the residuums, that from the nitrate of potash is the more valuable; but both the sulphates of potash and soda are at a low price, being used in forming other cheap preparations, such as alum and soda.

The nitrate of soda has an advantage over the other salt in point of purity. It is almost entirely free from extraneous substances, containing scarcely any common salt, while the common saltpetre, before it is entirely purified, contains a portion of that salt, and still more of the nitrates of magnesia and lime. [*Ibid.*

Green Pigments.

1. *Bluish Green.*—Grind on a piece of unpolished glass, and with a glass muller, adding pure water, three parts, by weight, of green oxide of chromium, and one part of oxide of cobalt. Dry the mixture on a sheet of bibulous paper, or other absorbing surface; then heat strongly in a crucible, to produce a union of the oxides.

2. *Cobalt Green.*—Proceed as just directed, substituting for the oxide of chromium, oxide of zinc precipitated from the nitrate of zinc by a weak solution of potash. The nitrate of zinc may be obtained by dissolving zinc in common nitric acid (aquafortis) di-

luted with its bulk of water. The precipitate must be well stirred with a spatula, and washed to get rid of the free potash and the nitrate of potash. To effect the washing, pour water copiously upon the precipitate, stir and pour off the liquid: this should be repeated several times. After the washing, pour the precipitate upon a canvass filter, which is covered with a sheet of unsized paper, and fixed upon a wooden frame resting on a wide mouthed vessel, or filter by a glass funnel, the bottom of which is stopped with linen rags.

In order to ascertain the best temperature for the union of the two oxides, divide the mixture into three parts, using for each a crucible, removing each crucible from the fire at a different temperature. The intensity of the colour is easily varied by altering the proportion of the oxide of cobalt.

This cobalt green, by a proper flux, yields a beautiful blue glass for painting china, &c.

In the Sevres porcelain manufactory a colour is used formed by the application of a particular flux to the bluish green. Varieties of shades may be procured by different mixtures of the oxides of chrome and cobalt. [*Ibid.*

A process for Varnishing Leather for Belts, Cartridge Boxes, &c.

The varnish for leather is the same as that for carriages, except that it contains less copal, and that the oil used in the varnish, for certain coarse articles, should be a little decomposed.

After having dressed and scraped the leather to be varnished, apply upon the flesh side a thin coat of glue water, to which has been added about an ounce of boiled linseed oil. The leather, when dried, is polished, and successive coatings applied until it becomes very smooth. Then mix one part of strong drying oil, (linseed oil, with a considerable dose of litharge,) and one of copal varnish, in an iron vessel, add well pulverized lampblack and spirits of turpentine, and set the whole over a fire. The leather which during this time has been kept in a closet, artificially heated, is now stretched upon a table, a very thin coat of the mixture quickly laid on with a flat brush, immediately replaced in the warm closet, and allowed to dry slowly: when dried it is polished with pumice stone, or which is better, with charcoal finely pounded and sifted. A second coat is applied in the same way, and the operation finishes with a third coat, which should be very lightly laid on, and be very smooth. The leather is now dried without polishing.

Leather for straps, &c. is sometimes manufactured by being passed between rollers; this enables it to receive a higher degree of polish and smoothness. Sometimes the leather is stained with lampblack mixed in glue water, and finished as we have just described. For articles which are not intended to bend, a greater proportion of copal varnish and more spirits of turpentine are incorporated with the coating mixture. These varnishes are laid on when cold. [*Ibid.*

Process for Silvering Iron.

Iron is not easily silvered. The following process will be found convenient in its application to both large and small iron utensils.

After having scoured the piece of iron to be silvered, let it be very evenly rubbed with sand paper, and then dipped into a warm solution of sulphate of copper, (blue vitriol,) or of acetate of copper, (verdigrease.) When its surface has become red, immerse it in clean water. Should the copper not cover the surface equally, it must be again dipped into the solution. The solution of the salt of copper should not be so strong as to produce a precipitate of small particles of copper. Melt silver in a crucible, and let the iron be immersed in it, and rubbed over with a proper tool, so that the silver may adhere equally to its surface. This operation of immersing and rubbing is repeated until the silver is very evenly applied. Care should be taken to press, and not to rub, the surface, lest the thin coat of copper, which facilitates the adhesion of the silver, should be scraped off. When the silvering seems complete, the articles are removed from the crucible and polished. [*Ibid.*

Polishing Powder.

Certain of the French manufacturers of polishing powder use in their manufacture scraps of old iron which they put into a tub and cause to rust quickly by sprinkling with water.

When a sufficient quantity of rust has thus been formed, it is collected by washing, and after allowing it to settle, it is dried and calcined in a crucible.

The longer the calcination is continued, the more the oxide approaches to a violet hue, and the harder its grain. At a very high temperature the oxide is partly reduced, its colour becomes more gray, and the grain is too hard for polishing.

The red oxide serves for polishing gold and silver, the violet oxide is fit for polishing steel.

When taken out of the crucible, it is first triturated, and then levigated, in order to collect the finest parts. [*Ibid.*

A few remarks on the Relation which subsists between a Machine and its Model. By Edward Sang, *Teacher of Mathematics, Edinburgh. Communicated by the Author.*

(Concluded from p. 349.)

Having said thus much on the relative strengths of a machine and of its model when at rest, I proceed to compare their strengths and actions when in motion.

This subject naturally divides itself into two heads; the one relating to the ability of the structure to resist the blows given by the moving parts, either in their ordinary action, or when, by accident, they escape from their usual course; the second treating on the changes which take place on the friction of the parts when these are enlarged or diminished.

The ability of a support to resist the impetus of a moving body, is estimated by combining the pressure which it is able to bear with the distance through which it can yield ere disruption take place. In the case of a support which acts longitudinally, the strength is proportional to the square of the linear dimensions, while the distance through which it can yield is as the linear dimension itself. Altogether, then, the ability to resist a blow is proportional to the cube of the length; that is, to the weight of the body which it is destined to act upon. If, then, the linear velocity of the machine is to be the same with that of the model, these parts, so far as this action is concerned, will be in keeping with each other.

In the case, however, of a lateral support, the distance through which it can yield without breaking is not augmented by an enlargement of the scale; so that, in these parts, the large engine is comparatively weak, even although the velocity of the motion be the same on the large as on the small scale.

But those motions which are most likely to produce accidents in this way, are generated by descents bearing a fixed proportion to the dimension of the engine: the velocity, therefore, is generally greater in the large engine than in the small one, so that large machines are more liable to accidents arising from the derangement of any of their motions than small ones are: they possess, however, more absolute strength, and are better able to resist any extraneous force. We must carefully distinguish between the absolute strength of any structure, or the power which it has of resisting impressions from without, and the ability of that structure to withstand the effects of derangement among its own parts.

Every one knows that a thermometer bulb is broken by a very slight blow, and that yet it may fall from a considerable height without injury. Yet a large ball of a proportionate thickness, though able to resist a much severer blow, is dashed to pieces by a fall. The insect is crushed by a touch; yet many species of insects possess the power of leaping to distances inconceivable, when compared with the minuteness of the animal.

Whether we consider its ability to resist mere pressure, or its ability to resist an impulse, the performance of an engine is not at all commensurate with that of its model. It remains for me to show, that as great a disparity is perceived when we consider the friction of the parts. As, perhaps, I have been rather general in my previous statements, I shall, when speaking of the friction, confine my attention to that very important instrument, the steam engine. A little consideration will enable any one to apply similar remarks to other machines.

The steam engine moves on account of the pressure of the steam

against the surface of the piston; which pressure may be estimated at about ten pounds per circular inch. The friction which this pressure has to overcome may be divided into three parts: the first including all friction caused by the packing of the piston and stuffing boxes, and which is proportional to the linear dimensions simply; the second including that part of the friction on the gudgeons which arises from the pressure of the steam upon the piston, and all other friction proportional to the square of the linear dimension; and the third including all that friction which arises from the weight of the parts, and which is thus proportional to the cube of the dimension.

Suppose now, for the sake of an example, that, in an engine whose cylinder is 20 inches across, and whose inciting pressure will thus be 4000 lbs., the friction of each kind is 100 lbs., the entire friction being thus 300 lbs., or about one-thirteenth part of the moving force. And, to make a handsome enlargement at once, let us propose one of which this may be a mere model, on the scale of 20 to 1; the new cylinder will be 4000 inches in diameter, and the pressure on the piston 1,600,000 lbs. The friction of the first species would amount to 2000, that of the second to 40,000, and that of the third to 800,000 lbs., so that the sum total of the friction, no less than 842,000 lbs., would be fully more than half of the inciting pressure.

It is then clear that such an enormous engine would be highly disadvantageous as a mechanical agent, and that if the enlargement were pushed a little farther, the whole of the moving force would be expended in overcoming the friction. There is, then, a greatest size beyond which it is impossible to proceed in the construction of the steam engine. But there is also a least.

Let us, in fact, take an engine similar to our first, but with a cylinder of only one inch in diameter. In such an engine the pressure of the steam upon the piston would be only 10 lbs.; the three kinds of friction would amount respectively to 5 lbs. 1 qr. and 1-80th part of a lb., the first kind alone being equal to half the inciting force. Were the diminution still further continued, the friction of the packing of the piston might equal the pressure of the steam.

From this it is apparent that, for each shape of steam engine, there are two extreme limits as to size, at which the utility of the engine ceases altogether, and between which there is placed a best size, or one which is accompanied by the most complete development of the powers of the instrument. A skilful arrangement of the parts may indeed, extend the limits both ways, and may thus change, considerably, the most advantageous size, yet, even with that assistance, very small or very large engines are less productive of force, in proportion to the quantity of coal they consume, than moderately sized ones are; and, in many instances, it would have been better to have employed two or three middle-sized engines than a single one possessed of two or three times the nominal power.

Every instrument, whether it be used for the generation or for the transference of power, has a best size, and a best form. The contemplation of the whole animal and vegetable kingdoms teaches this truth. Each species of animal attains to a determinate size, be-

yond which it seldom proceeds, and short of which it seldom stops, unless man has interfered with the regular course of nature, and deranged, as his contrivances too often do, that determinate succession of events which is conspicuous in the history of each tribe of what we are pleased to call the lower animals. Each animal and each vegetable, in its progress from infancy to maturity, assumes, at each stage of that progress, such a form as best assorts with the consolidation of its parts, and with the mode of its living. The wisdom and the benificence of this arrangement, and the skilfulness with which it is made, become the more apparent when we carry our contemplations beyond the globe which we inhabit to those other worlds which circulate round the same sun. Were man, in his present state, and with his present powers, planted on the surface of Jupiter, he would be crushed beneath his own weight: and if, on the surface of that planet, there do exist beings of the same structure and material as man, one of us would be a man-mountain among them. If, on the other hand, we were transported to the surface of the moon, or of one of the asteroïds, our strength would fit us for progressing rather in the manner of the grasshopper than of the man: bipeds, living and moving as we do, would there realize the counter vision of Gulliver.

The sizes, then, of the objects which, on the surface of this earth, surround us, are not fixed by chance, but determined by the immutable laws of nature; and, in every case, nature has pushed her exertions to the utmost. There is a limit, both ways, to the size of quadrupeds; there is a limit, both ways, to the size of birds; and, although myriads of insects may be as yet unknown, I hesitate not to affirm that, among these also, we have the double limit. These are not mere speculative truths; they teach us this useful and needful lesson, that there are bounds beyond which no ingenuity can carry us, and towards which we can only hope to approach. How often have men attempted to plume themselves with wings? How many years were spent in search of the golden secret? How many fortunes have been wasted in the contrivance of perpetual motions? And, to come nearer the present moment, how many have ruined themselves with the locomotive engine? This last is the bubble of the present day, and on it I shall make a few observations.

At the surface of Jupiter a steam engine of twenty horses' power would be unable to move: at the surface of our earth, one of perhaps 1000 horses' power might perform pretty well; but at the surface of the moon they might be made of, perhaps, 20,000 horses' power—supposing the pressures of the atmospheres in the three cases to be alike. On Jupiter a steam carriage would be an absolute chimera; on the earth it is barely possible; but on the moon nothing would be more usual. An intensity of gravitation slightly greater than that which the earth exerts, would altogether preclude the hope of obtaining a locomotive engine. As it is, on flat rail-roads they perform well; as the road becomes inclined, they become less practicable; and, on common roads, nothing but the most consummate skill in the selection and in the use of the material, as well as in the contrivance of the parts, can ever be successful in their construction. Security demands

strength, strength requires weight, weight increases the friction, friction calls for additional power, and power can be procured only by an increase of weight. To reconcile these conflicting claims is not the task for a beginner in mechanical contrivance, but for one well versed alike in the theory and in the practice of the arts. Models are of no use, for, although the model be able to climb a considerable ascent, that fact is no guarantee that the full-sized instrument will be able to follow its prototype. Let those who speculate on this matter remember that the elephant inhabits the plains, and leaves the mountains to be tenanted by the smaller tribes; and let them also recollect, for the fact bears more upon the subject than at first may appear, that the larger animals are most easily exterminated; that we have the fox and the rat, though the wolf be long since gone.

In the remarks which I have made, it has been my wish to place the subject in such a light as might enable all to perceive the importance of its bearings; and I have refrained from being practical, lest, in making myself better understood by some, I had rendered my meaning obscure to others. My intention throughout has been to inculcate the important truth, that no machine can ever be enlarged or diminished in proportion.

[*New Edinburgh Philos. Mag.*

Observations on the Ignis Fatuus, or Will-with-the-Wisp, Falling Stars, and Thunder Storms. By L. Blesson, *Major of Engineers, Berlin.*

The first time I saw the Ignis Fatuus, or Will-with-the-Wisp, was in a valley in the Forest of Gorbitz, in the Newmark. This valley cuts deeply in compact loam, and is marshy on its lower part. The water of the marsh is ferruginous, and covered with an iridescent crust. During the day bubbles of air were seen rising from it, and in the night blue flames were observed shooting from and playing over its surface. As I suspected that there was some connexion between these flames and the bubbles of air, I marked during the daytime where the latter rose up most abundantly, and repaired thither during the night; to my great joy I actually observed bluish purple flames, and did not hesitate to approach them. On reaching the spot they retired, and I pursued them in vain; all attempts to examine them closely were ineffectual. Some days of very rainy weather prevented further investigation, but afforded leisure for reflecting on their nature. I conjectured that the motion of the air on my approaching the spot, forced forward the burning gas, and remarked, that the flame burned darker, when it was blown aside; hence I concluded that a continuous thin stream of inflammable air was formed by these bubbles, which, once inflamed, continued to burn—but

which, owing to the paleness of the light of the flame, could not be observed during the day.

On another day, in the twilight, I went again to the place, where I awaited the approach of night: the flames became gradually visible, but redder than formerly, thus showing that they burnt also during the day: I approached nearer, and they retired. Convinced that they would return again to the place of their origin when the agitation of the air ceased, I remained stationary and motionless, and observed them again gradually approach. As I could easily reach them, it occurred to me to attempt to light paper by means of them, but for some time I did not succeed in this experiment, which I found was owing to my breathing. I therefore held my face from the flame, and also interposed a piece of cloth as a screen; on doing which I was able to singe paper, which became brown coloured and covered with a viscous moisture. I next used a narrow slip of paper, and enjoyed the pleasure of seeing it take fire. The gas was evidently inflammable, and not a phosphorescent luminous one, as some have maintained. But how do these lights originate? After some reflection I resolved to make the experiment of extinguishing them. I followed the flame; I brought it so far from the marsh, that probably the thread of connexion, if I may so express myself, was broken, and it was extinguished. But scarcely a few minutes had elapsed, when it was again renewed at its source (over the air bubbles) without my being able to observe any transition from the neighbouring flames, many of which were burning in the valley. I repeated the experiment frequently, and always with success. The dawn approached, and the flames, which to me appeared to approach nearer to the earth, gradually disappeared.

On the following evening I went to the spot, and kindled a fire on the side of the valley, in order to have an opportunity of trying to inflame the gas. As on the evening before, I first extinguished the flame, and then hastened with a torch to the spot whence the gas bubbled up, when instantaneously a kind of explosion was heard, and a red light was seen over eight or nine square feet of the surface of the marsh, which diminished to a small blue flame, from two and a half to three feet in height, that continued to burn with an unsteady motion. It was therefore no longer doubtful that this ignis fatuus was caused by the evolution of inflammable gas from the marsh.

In the year 1811, I was at Malapane, in Upper Silesia, and passed several nights in the forest, because ignis fatui were observed there. I succeeded in extinguishing and inflaming the gas, but could not inflame paper or thin shavings of wood with it. In the course of the same year I repeated my experiments in the Konski forests, in Poland. The flame was darker coloured than usual, but I was not able to inflame either paper or wood shavings with it; on the contrary, their surface became speedily covered with a viscous moisture.

In the year 1812, I spent half a night in the Rubenzahl Garden, on the ridge of the Reisengebrige, close on the Schneekoppe, which constantly exhibits the Will-with-the-Wisp, but having a very pale co-

lour. The flame appeared and disappeared, but was so mobile that I could never approach sufficiently near to enable me to set fire to any thing with it.

In the course of the same year I visited a place at Walkenried, in the Hartz, where these lights are said always to occur; they were very much like those of the Neumark, and I collected some of the gas in a flask. On the day after, I found by experiment that it occasioned cloudiness in lime water, a proof of its containing carbonic acid.

I observed accidentally another phenomenon allied to this, at the Porta Westphalica, near Minden. On the third of August, 1814, we played off a fire-work from the summit, to which we had ascended during the dark, and where no ignis fatuus was visible. But scarcely had we fired off the first rocket, when a number of small red flames were observed around us below the summit, which, however, speedily extinguished—to be succeeded by others on the firing of the next rocket.

These facts induced me to separate the ignis fatui from the luminous meteors, and to free them from all connexion with electricity. They are of a chemical nature, and become inflamed on coming in contact with the atmosphere, owing to the nature of their constitution.

I think it highly probable that the fires that sometimes break out in forests are caused by these lights.

Falling Stars.—I have frequently observed on meadows and fields that slimy leek-green matter, which is commonly taken for the product of falling stars, fire-balls, &c. It speedily passes into a state of putrefaction, and dissolves into a whitish form, which at length disappears. I cannot venture to speculate on its formation. This slime appears to me to be intimately connected with the plants which generally surround it, although I cannot deny its flattened roundish shape. Once, indeed, I observed it on the bare ground, at a distance from vegetables of every kind. In Finland, I observed it on rocks, but they were richly clothed with mosses. Whatever opinion may be formed as to it, the plants, particularly the cryptogamic ones in its vicinity, ought to be examined. I may add, that I observed this jelly in a forest under a fir tree, where there was no possibility of its having fallen from the sky.*

Thunder Storm.—On ascending a mountain which rises rather more than 2000 feet above Teschen, I encountered a storm, concerning which the following particulars are not without interest. The wind blew from the south, and, shortly after I commenced my ascent enveloped the upper part of the mountain in clouds. The oppressive feel of the air seemed to announce a coming thunder storm, but hitherto neither thunder nor lightning had occurred. The nearer I approached to the clouds, the darker was their colour, but still the sun

* The so called *Star-jelly* is said to be a kind of fungus, Actiomyce Horkelli. —*Vide* Oken Isis, 1830. ii. 135.

shone brightly upon Teschen. The clouds, as seen from below, which exhibited a remarkable rotatory motion, appeared sharply bounded, and I was therefore surprised, when I came near to them, to find, as usual, only a gradually denser and denser cloud, which speedily wet me through. A particular rotatory wind appeared to prevail in this region (above half way up the mountain,) occasioning a piercing cold, which was the more striking, as contrasted with the sultry heat and stillness below the clouds.

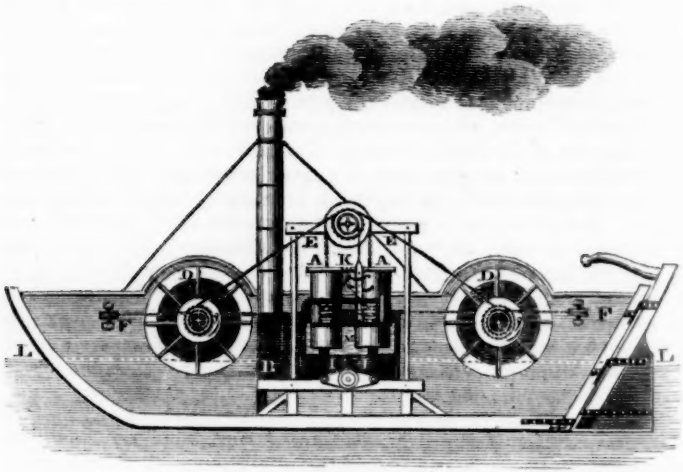
I had hardly entered the denser part of the cloud, when it was so dark, that I could with difficulty distinguish an object at my foot—(I name this dark, because I do not know any other expression for it; it is not, however, want of light; we have a white veil before us, which is constantly moving with a rotatory motion, which we cannot compare with any thing else.) I was scarcely in the cloud before I felt throughout my whole body a kind of expansive tension, which was excessively oppressive, and seemed to affect the walking of my companion, a poodle dog, even more than it did myself. The hair appeared to bristle up, and it seemed to me as if something was drawn out of the whole of my body. But this electric tension was of a very different character from that from an isolator. I bent down, in order to see the grass that surrounded me, and on which no dew was observed,—when I was suddenly enveloped in a bright sea of light, with a yellow lustre, and perceived, along with a violent noise, a sudden cessation of the former tension. The noise may be best compared with a distant dull cannon shot, only more continuous and louder, or may be compared with the explosion in a mine; but no rolling was heard. The grass was in motion, but I was too much surprised and confounded to make more particular observations. The convulsive motion of the cloud ceased for a moment, but immediately began again, and with it the tension was renewed. During the moments of rotation, the vaporic particles appeared to be arranged in rows into fibres, which moved still more violently amongst each other,—and after the explosion all was again calm, and a mere fog or cloud was visible. My poodle dog was the first object of my attention; it seemed to me to be thicker than usual, and his hair bristled up; I stroked it several times, and saw it bristle up under my hand. A new flash of lightning took place, and I could distinctly perceive, notwithstanding the light, that the whole body of my dog glimmered with a peculiar lustre, the hair, formerly bristled up, now fell flat, and he sunk down on his knees. This was a consequence of the stronger streaming of electricity from him than I experienced, and which seemed, as it were, to draw me from the mountain. Although during the tension, the feeling of drawing out was continuous and always increasing in intensity, still it was strongest at the moment when the electrical discharge took place; the hair bristled up more, and I felt something, as it were, passing from out my interior, and instantaneously all was passed, and the hair flat again. On the next flash of lightning, I noticed the appearance of the grass; on the discharge it appeared shining at its extremities; it became erect, when I felt the tension in-

creasing in my body, but became gradually wet, and then sunk down again. [*Ibid.*

First British Experiment in Steam Navigation.

Sir,—The accompanying sketch, fig. 1, represents a lateral section of the original steam-boat, invented by my father, the late William Symington, and the efficiency of which was twice proved, though on different scales of magnitude, by him, viz. once in 1788, on Dalswinton Lake, Dumfriesshire—and another time, in 1789, on the Forth and Clyde Canal.

Fig. 1



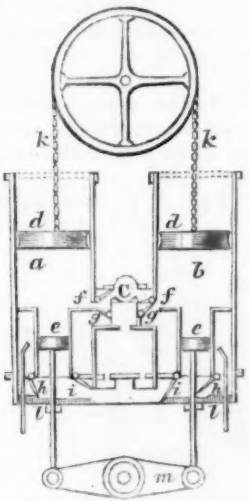
Description.

A A, the two cylinders. B, the boiler. C, steam pipe. D D, paddle wheels, situated and wrought in a trough extending from the stem to the stern of the boat, which trough allowed free ingress and egress to the water. E E, connecting chains. F F, direction pullies. G G, ratchet wheels, which communicated motion to the paddle wheels. I I, lower piston rods. H, beam. K, plug-frame and hand gear. L L, flotation line. M, water cistern.

The merit of these exemplifications has been in several publications erroneously awarded to the late Patrick Miller, Esq. The engine was of a peculiar construction, partly for the purpose of avoiding infringement on Mr. Watt's patent rights. It had two cylinders on

atmospheric principles, each cylinder having two pistons, the lower of which acted as an air-pump. The more clearly to illustrate the principles of this part of the machinery, a section of the two cylinders is exhibited at fig. 2. *a* and *b* are the cylinders, *a* being in the act of receiving, and *b* of condensing steam; *c* the steam-pipe; *d d*, atmospheric pistons, producing, by their alternate action on the ratchet wheels, rotary motion; *e e*, exhausting pistons; *f f*, steam valves; *g g*, exhausting valves; *h h* foot valves; *i i*, discharge valves; *k k* connecting chain; *l l*, injecting pipes; *m*, beam. From this sketch it must be evident, that while the steam is elevating the atmospheric piston of either cylinder, the lower piston is necessarily depressed, and performs the exhausting stroke of the opposite cylinder, both pistons, being connected by means of the beam.

Fig. 2.



The exemplification of 1789 was propelled by the power of steam at the rate of six miles an hour; thus satisfactorily proving that the performance of the *Charlotte Dundas* in 1802, as a tug, was *not* "the first public trial of steam for a useful purpose in navigation," as asserted in a report of the Forth and Clyde Canal Committee, contained in your Magazine of July 9, 1831.

Sensible of the readiness with which you have inserted my former communications, and perfectly prepared to substantiate every particular which I have advanced,

I am, &c.

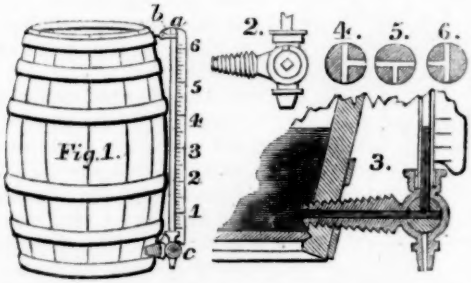
Bromley, Nov. 17, 1832. WILLIAM SYMINGTON.

[*Mech. Mag.*

Hennekey's Gauge for Standing Casks.

We extract from the last part of the "Transactions of the Society of Arts" the following more particular description of the new mode of gauging casks introduced by Mr. Hennekey, of High Holborn, of which we quoted a brief notice from Mr. Babbage's "Economy of Machinery," in our last volume, p. 215. The invention is of such manifest utility, that it can scarcely fail to come into universal use; and has very deservedly obtained for the inventor the honour of the society's silver Isis medal.

Fig. 1 is an elevation of a cask with the gauge applied to it. Fig. 2 is the cock *c* in fig. 1, on a larger scale, it has three openings, one above, one below, and one in the side; by means of the screw in the latter opening, it is fixed firmly into the cask, as shown in the section, fig. 3. An upright wooden bar is then secured to the outside of the cask, having a groove *b* in it corresponding with, and being, as it were, a continuation of the upper pipe of the cock *c*; in this groove is placed a glass tube, open at both ends, the lower part of which drops into the upper pipe of the cock, and is fixed there by means of white lead, or any other cement not acted on by spirit or by water; the tube is also secured above by a ring or cap. Parallel with the tube is a brass plate, on which the divisions are subsequently to be marked. The plug of the cock has three ways, or openings, as shown in figs. 3, 4, 5, 6. A tongue, or index, projects from the plug, indicating the position of one of these ways; it may be seen in fig. 2; the position of which corresponds with that of the sectional view, fig. 3.



The apparatus being complete as above described, the cock is turned to the position fig. 3, and the cask is filled by a hole at the top. It is evident, therefore, that the liquor will stand in the tubes at the same height it does in the cask, provided the tube is wide enough to avoid any sensible error from capillary attraction: this height is marked as the *b* or zero of the scale. The plug of the cock is then turned to the position fig. 6, and a given measure is drawn off, forming the unit of the scale. In the large standing casks, the quantity that is found practically the most convenient is five gallons. The plug is then returned to its former position, and the column of liquor in the tube will now be lower than the zero; the point at which it stands is to be marked on the scale as before. Proceeding in this manner to draw off successively five gallons at a time, the whole contents of the cask are thus transferred to the scale, each division of which represents five gallons, and the scale may be numbered upwards or downwards, as may be found most convenient. The scale should not be continued to the bottom of the tube, but should terminate at the point where the dregs are usually found to begin. It is best not to leave a column of liquor constantly in the tube, as a deposit in that case takes place on the inside, which obscures it; when,

therefore, any liquor has been drawn off, the plug of the cock should be brought to the position fig. 4, and previously to drawing off a fresh quantity, the plug should be brought to the position fig. 6.

By the adoption of this method of graduation, the liquor dealer may take stock every day, in a few minutes, by merely turning the plugs to the position fig. 3, and then reading the number corresponding with the height of liquor in the glass to be attached to each cask.

Mr. Hennekey also finds these graduated casks to save much time, and give greater precision, in making different liquids to form those compounds which are required by his customers. If, for example, he wants to mix together spirit and sirop in any given proportion, he puts the two liquors into separate casks on the ground floor, and places an empty cask, also graduated, on the platform above, and then pumps from the lower casks into the upper one, the determinate quantity of each ingredient; he then allows the mixture to remain for twenty-four hours, after which he reads off the quantity, and by comparing this with the previously known quantity of the separate ingredients, ascertains how much has been lost in volume by condensation, and therefore how much additional price must be charged as an equivalent. [*Ibid.*

Improved Pill Boxes.

A patent has recently been granted to Messrs. Mosley and Bell, of Wandsworth, Surry, for a new mode of manufacturing pill boxes by machinery. The forms of these boxes are produced by pressure with dies; they are made of thick paper, and appear extremely neat, having embossed surfaces. The sides of the boxes are of the same piece as the tops or bottoms, and without joints, which prevents the inconvenience so much complained of in the former pill boxes, where the tops and bottoms being only stuck into the rim which constitute the sides of the boxes, were perpetually falling out, and consequently rendering the boxes useless, to the very great inconvenience and loss of the druggist.

Insignificant as this article may appear, we understand that the demand amounts to many thousand gros per annum, and that a very great number of children are employed in the manufacture.

[*Lond. Jour.*

Paddington and London Steam Carriage Company.

The first carriage of this company was exercised along the Mile-End, Hackney, and city roads, on Saturday last (26th Jan.) about noon; and is now in the painter's hands, City-road, for completion, which is expected to be in about a month, when it will commence

running on the road, but only for a few journeys per day until two more carriages are completed, when the whole will ply regularly between Paddington and the city. It was thought by the managers prudent to see one carriage actually in action, in a finished state, before the others were put in hand, in order that they might avail themselves of any improvements that the performances of the first may suggest.

[*Mech. Mag.*

Saltash Steam Floating Bridge.

A bridge at the Saltash Ferry has long been ardently desired by the public, and an endless variety of plans propounded by the influential gentlemen in the vicinity had proved abortive. To hit upon an expedient which should perfect the land conveyance between the two counties, without interfering with the navigation on the river, and the restrictions of government, was given up as hopeless; still, from the spirit of enterprise, (the river Dart havingfirst become tributary,) the Tamar at last yields to science and the arts. The float forms a parallelogram of about fifty feet by thirty feet, open at both ends; the centre is occupied by two engines of six horse power each, boxed over from end to end, so as to be entirely concealed externally; the engines work two weeels, on which rest two chains, which are laid from shore to shore and traverse through the engine room. On either side the engine room is a clear space of fifty feet by ten, for carriages, horses, cattle, and foot passengers. Carriages of every description are run in and out without detaching the horse; and the passage is accomplished in five minutes. The prows, or platforms, for shipping and landing are four in number, two at each end, each twenty-one feet long by ten. They are so arranged as to drop on the shore, and forms almost a level platform. [*Devonport Telegraph.*

Magic Lanterns.—Etching.

The difficulty of procuring good transparent varnishes in the country, and of laying them on, is so great, that good slides for magic lanterns are seldom made out of London. I send you, therefore, an account of two different methods that I have made use of for some time, by either of which this difficulty is obviated, and any persons who can draw or etch may make excellent slides for themselves.

1. Take a piece of crown glass and grind it to a uniform surface, free from scratches, with washed flour of emery. Lay it on the subject to be copied, and trace the outline with a good cedar pencil; then bring out the middle lights by rubbing the parts with a piece of soft wood, such as a skewer; produce the shades with the cedar pencil, softening them off with a pointed cork or roll of paper, and touch the

high lights with a little mastic varnish; then black up to the outline with lampblack and turpentine varnish. By this means, statues, skeletons, &c. may be worked up to a greater pitch than they can be with the varnish.

2. By my second method, the finest engravings may be introduced. Ink the plate with the best printers' ink, or apply coloured varnishes to the different parts, and carefully rub them off without mixing them; then pour on a clear solution of isinglass in weak spirits of wine, about the thickness of a shilling. In about twelve hours it may be taken off, and then fixed on a piece of glass, and blacked up to the outline.

I have no doubt that many persons would learn to etch if it were not for the expense of the copperplates and the trouble of sending to the printers for impressions. I have found that common tin-plate will answer very well for learning upon, and that impressions may be taken in a smith's vice between two pieces of flat, thick cast iron. The plate, however, must not be larger than a card. Choose the plate free from scratches; then cover it with etching ground or bees' wax; trace the subject in the usual way; put on the border of wax, and in biting in use rather a weaker acid, five or six parts of water to one of nitric acid; do not let it remain so long as on copper; the light parts must be stopped out in time, as the acid acts quickly upon it.

[*Mech. Mag.*

¶ POPULAR SCIENCE.

No. IV.

SELECTIONS FROM BREWSTER'S OPTICS.*

Decomposition of Light by Absorption.

If we measure the quantity of light which is reflected from the surfaces and transmitted through the substance of transparent bodies, we shall find that the sum of these quantities is always less than the quantity of light which falls upon the body. Hence we may conclude that a certain portion of light is *lost* in passing through the most transparent bodies. This loss arises from two causes. A part of the light is scattered in all directions by irregular reflection from the imperfectly polished surface of particular media, or from the imperfect union of its parts; while another, and generally a greater portion, is *absorbed*, or stopped by the particles of the body. Coloured fluids, such as black, and red ink, though equally homogeneous, stop, or absorb, different kinds of rays, and when exposed to the sun they become heated in different degrees; while pure water seems to transmit all the rays equally, and scarcely receives any heat from the passing light of the sun.

* American edition: Carey, Lea, & Blanchard, Philadelphia.

When we examine more minutely the action of coloured glasses and coloured fluids in absorbing light, many remarkable phenomena present themselves, which throw much light upon this curious subject.

If we take a piece of blue glass, like that generally used for finger glasses, and transmit through it a beam of white light, the light will be a fine deep blue. This blue is not a simple homogeneous colour, like the blue or indigo of the spectrum, but is a mixture of all the colours of white light which the glass has not absorbed; and the colours which the glass has absorbed are those which the blue wants of white light, or which, when mixed with this blue, would form white light. In order to determine what these colours are, let us transmit through the blue glass the prismatic spectrum; or, what is the same thing, let the observer place his eye behind a prism and look through it at the sun, or rather at a circular aperture made in the window shutter of a dark room. He will then see through the prism a spectrum far below the aperture. Let the blue glass be now interposed between the eye and the prism, and a remarkable spectrum will be seen, deficient in a certain number of its differently coloured rays. A particular thickness absorbs the middle of the red space, the whole of the orange, a great part of the green, a considerable part of the blue, a little of the indigo, and very little of the violet. The yellow space, which has not been much absorbed, has *increased in breadth*. It occupies part of the space formerly covered by the orange on one side, and part of the space formerly covered by the green on the other. Hence it follows that the blue glass has absorbed the red light, which when mixed with the yellow light, constituted orange, and has absorbed also the blue light, which, when mixed with the yellow, constituted the part of the green space next to the yellow. We have, therefore, by absorption, decomposed green light into yellow and blue, and orange light into yellow and red; and it consequently follows, that the orange and green rays of the spectrum, though they cannot be decomposed by prismatic refraction, can be decomposed by absorption, and actually consist of two different colours possessing the same degree of refrangibility. *Difference of colour is, therefore, not a test of difference of refrangibility*, and the conclusion deduced by Newton is no longer admissible as a general truth: "That to the same degree of refrangibility ever belongs the same colour, and to the same colour ever belongs the same degree of refrangibility."

With the view of obtaining a complete analysis of the spectrum, I have examined the spectra produced by various bodies, and the changes which they undergo by absorption when viewed through various coloured media, and I find that the colour of every part of the spectrum may be changed not only in intensity, but in colour, by the action of particular media; and from these observations, which it would be out of place here to detail, I conclude that the solar spectrum consists of three spectra of equal lengths, viz. a red spectrum, a yellow spectrum, and a blue spectrum. The primary red spectrum has its maximum of intensity about the middle of the red space in

the solar spectrum, the primary yellow spectrum has its maximum in the middle of the yellow space, and the primary blue spectrum has its maximum between the blue and the indigo space. The true minima of each of the three primary spectra coincide at the two extremities of the solar spectrum.

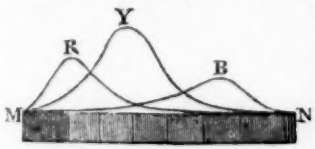
From this view of the constitution of the solar spectrum we may draw the following conclusions:—

1. Red, yellow, and blue light exist at every point of the solar spectrum.

2. As a certain portion of red, yellow, and blue, constitutes white light, the colour of every point of the spectrum may be considered as consisting of the predominating colour at any point mixed with white light. In the red space there is more red than is necessary to make white light with the small portions of yellow and blue which exist there; in the yellow space there is more yellow than is necessary to make white light with the red and blue; and in the part of the blue space which appears violet, there is more red than yellow, and hence the excess of red forms a violet with the blue.

3. By absorbing the excess of any colour at any point of the spectrum above what is necessary to form white light, we may actually cause white light to appear at that point, and this white light will possess the remarkable property of remaining white after any number of refractions, and of being decomposable only by absorption. Such a white light I have succeeded in developing in different parts of the spectrum. These views harmonize in a remarkable manner with the hypothesis of three colours, which has been adopted by many philosophers, and which others had rejected from its incompatibility with the phenomena of the spectrum.

The existence of three primary colours in the spectrum, and the mode in which they produce, by their combination, the seven secondary or compound colours which are developed by the prism, will be understood from the annexed figure, where M N is the prismatic spectrum consisting of three primary spectra of the same lengths, M N, viz. a red, a yellow, and a blue spectrum. The red spectrum has its maximum intensity at R, and this intensity may be represented by the distance of the point R from M N.



The intensity declines rapidly to M and slowly to N, at both of which points it vanishes. The yellow spectrum has its maximum intensity at Y, the intensity declining to *zero* at M and N; and the blue has its maximum intensity at B, declining to nothing at M and N. The general curve which represents the total illumination at any point will be outside of these three curves, and its ordinate at any point will be equal to the sum of the three ordinates at the same point. Thus the ordinate of the general curve at the point Y will be equal to the ordinate of the yellow curve, which we may suppose to be ten, added to that of the red curve, which may be 2, and that of the blue, which may be 1. Hence the general ordinate will be 13. Now, if we sup-

pose that 3 parts of yellow, 2 of red, and 1 of blue make white, we shall have the colour at Y equal to 3 + 2 + 1, equal to 6 parts of white mixed with 7 parts of yellow; that is, the compound tint at Y will be a bright yellow without any trace of red or blue. As these colours all occupy the same place in the spectrum, they cannot be separated by the prism; and if we could find a coloured glass which would absorb seven parts of the yellow, we should obtain at the point Y a white light which the prism could not decompose.

Meteorological Observations for April, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches				Inches.	
☉	1	41°	68°	29.93	29.93	38°	W.	Moderate.		Hazy.
	2	40	70	.93	.95	32	W.	do.		Hazy.
	3	44	57	.90	.84	54	SE. S.	Calm.	0.32	Cloudy—showers.
	4	52	68	.84	.63	54	SW. W.	Moderate.		Fog—light clouds.
	5	50	59	.63	.60	30	W.	do.		Hazy—flying clouds.
	6	37	59	.68	.85	39	W.	do.		Clear day.
	7	39	61	30.00	30.00	42	NW. S.	do.		Lightly cloudy—cloudy—rain.
	8	52	43	29.54	29.50	53	SE.	do.	0.35	Cloudy—clear—shower.
	9	49	56	.64	.74	36	S.	do.	0.09	
☾	10	45	65	30.00	30.00	36	W.	Blustering		Clear day.
	11	46	69	29.94	29.70	39	W.	Moderate.		Clear day.
	12	49	74	.40	.30	52	SE. S.	do.		Light clouds—lightly cloudy.
	13	37	46	.30	.00	30	SE. W.	Blustering.		Cloudy—flying clouds.
	14	33	56	.80	.87	30	NW.	do.		Flying clouds—clear.
	15	32	54	30.04	30.10	17	W. SE.	do.		Clear day.
	16	36	55	.10	.10	24	NE. SE.	Moderate.		Clear—light clouds.
	17	41	49	29.93	29.93	40	E. SE.	do.		Lightly cloudy—do.
	18	43	65	30.00	30.05	40	SE. W.	do.	0.04	Drizzle.
	19	42	62	.90	.80	40	W. S.	do.		Clear day.
⊗	20	46	69	.10	.10	39	W.	do.		Clear day.
	21	50	71	29.80	29.80	49	S.	do.		Clear—hazy.
	22	54	70	.94	.75	45	SW.	do.		Fog—sultry.
	23	56	78	.73	.75	54	W.	do.		Lightly cloudy—clear.
	24	40	49	.85	.85	34	SW.	do.		Cloudy—hazy.
	25	37	50	30.06	.85	34	E.	do.		Cloudy day.
	26	38	61	.00	.04	36	W.	do.		Clear—cloudy.
	27	36	64	.10	.20	33	W.	do.		Clear day.
	28	44	72	.20	.10	40	SE.	do.		Clear—light frost—clear.
	29	51	82	29.96	.00	57	S. SW.	do.		Light clouds—do.
	30	54	88	.90	.90	57	SW. S.	do.		Light clouds—hazy.
	Mean	43.50	61.30	29.89	29.87	39.5	SW.	do.	1.80	Light clouds—hazy.

	Thermometer.	Barometer.
Maximum height during the month,	88. on 30th.	30.20 on 19th, 27th, & 28th.
Minimum do.	32. on 15th.	29.30 on 1st.
Mean do.	52.50	29.88

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ERRATA.

Page 84 line 17 *for* Laninez *read* Laissez.
" 93 dele the note at the bottom.
" 96 line 10 *for* Blanvelt *read* Blauvelt.
" 127 Note, *for* Eaude *read* Eau de.
" 209 dele *Hot Air Blast* in the running title.
" 300 line 36 *for* roller *read* rolled.
" 319 dele line 9 and *read* see specification, p. 180.
" 330 to 338 require 2 subtracted from each.

There are several other obvious mistakes, which are unavoidable, as the distance of the Editor from the press prevents his seeing a corrected proof.